CHEMICAL PUMPS

Manufacturing Chemist

incorporating

MANUFACTURING PERFUMER

A PUBLICATION OF THE LEONARD HILL TECHNICAL GROUP

Vol. XXXII No. 4 APRIL 1961

ROTO-CUBE MIXING MACHINES

The three-dimensional mixing action of the Rotocube, caused by the rotation of the diagonally mounted cube-shaped drum, is the basis of its outstanding efficiency and rapid action.

This complex motion completely avoids any 'dead spots' so that mixing is carried out accurately, consistently and quickly. Where the materials are reasonably free-flowing, the Rotocube can be employed without the use of an impeller; this is advantageous where it is desired to avoid attrition and pulverizing. When an impeller is used, as it must be on ingredients which tend to agglomerate, it revolves slowly in the same direction as the drum, and thereby avoids any undue impacting of the materials. The machines are extremely easy to charge, discharge and clean. *The illustration shows the laboratory model.*

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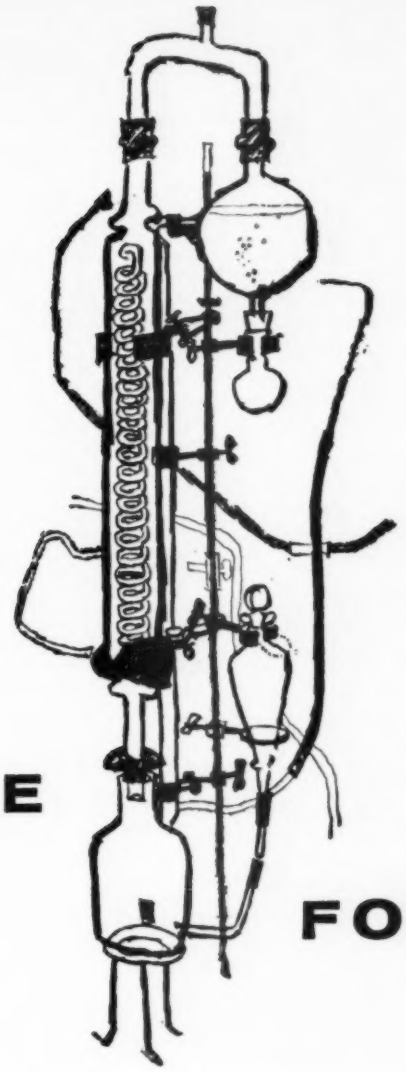

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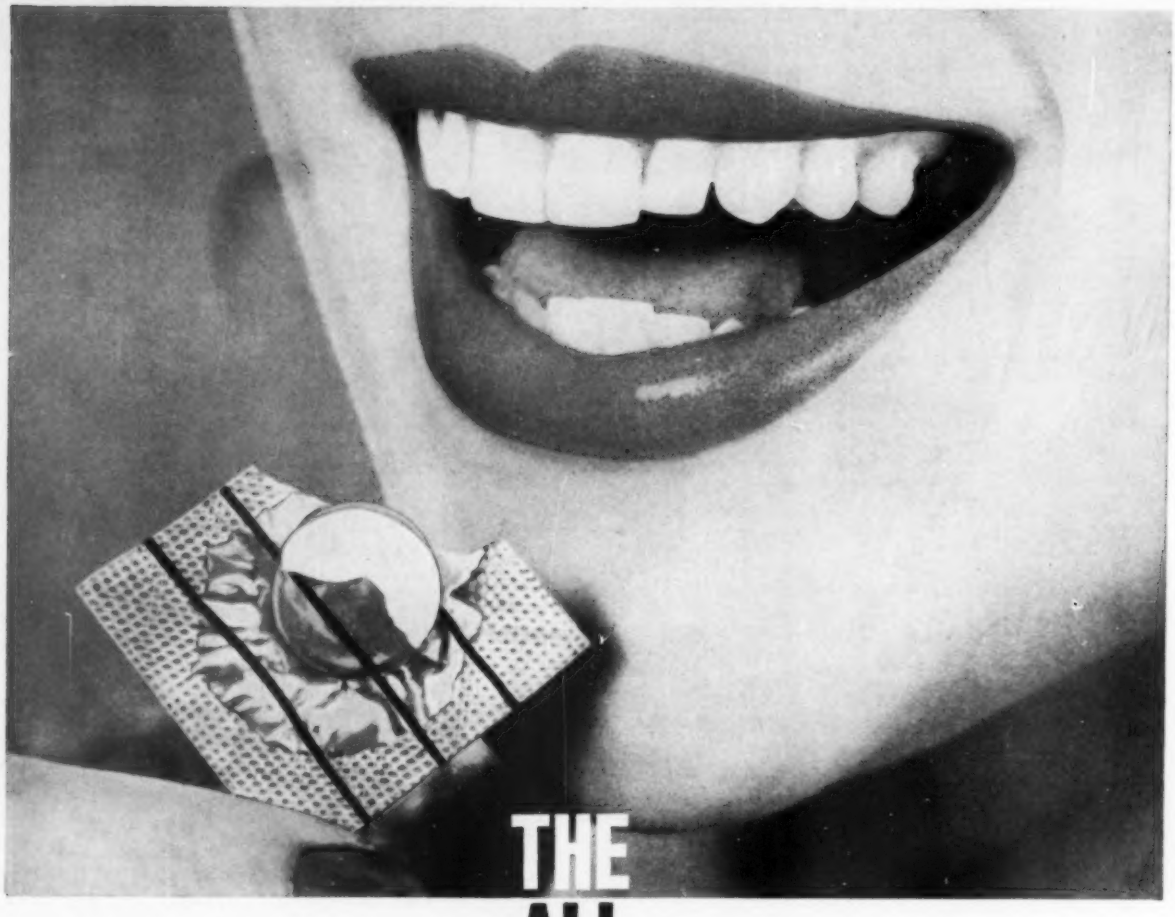

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THIS is the moment all your research, your manufacture and packaging have led up to: the moment of taking. How good is your product then?

In Venesta Foils' strip, it will be just as it left your factory. *Individual* packaging has sealed it from air, light and dirt; protected it in transit; kept it untouched by hand—even the user's.

Yet in the long run Venesta Foils' strip packaging costs *less* than other and less hygienic ways of packing. Our advisory service will be glad to show you why.

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The five freedoms of Venesta Foils' strip

Freedom from contamination—your product individually sealed
Freedom from damage—in delivery, storage and carrying
Freedom from high labour costs—packing is fully mechanised
Freedom from bulk—easier handling, lower freight costs
Freedom for design—each individual item carries your name, trade mark or dosage right up to the moment of taking.

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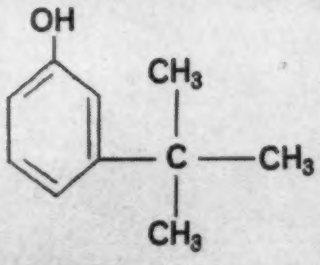

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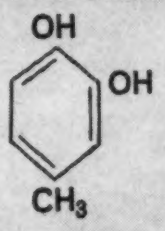

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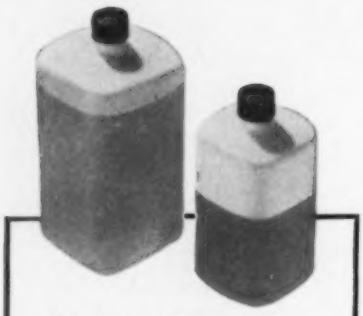

ONE GALLON & HALF-GALLON

for good cheap packaging of bulk liquids

Price need no longer stand between you and the use of lightweight polythene containers which are suitable for a wide range of products. These new Poly-Tainers offer you every advantage.

Check over this list!

LIGHTWEIGHT: Poly-Tainers are made of lightweight high density polythene, with obvious economies for you in handling and freight costs.

STRONG: Poly-Tainers are almost unbreakable, therefore reducing outer packaging costs.

CHEAP: Modern large-scale production enables these Poly-Tainers to be offered AT VERY COMPETITIVE PRICES.

CHEMICALLY INERT: Poly-Tainers are non-toxic and, therefore, may be used to pack a wide range of products.

COMPACT: The neat square shape simplifies packing and handling.

EASY POURING: The wide-aperture neck makes pouring easy.

TRANSLUCENT: The translucent self-coloured material ensures that the content-level is always visible. Long runs can, however, be produced in any of several attractive colours.

COLOUR PRINTED, embossed or labelled: For eye-appeal or easy identification Poly-Tainers can be printed or embossed. They can also be labelled and adhesives are available for both machine and hand-labelling.

TWO SIZES: Poly-Tainers are offered in one gallon and half-gallon sizes, each fitted with two-start compression-moulded cap with either polythene or Vinylite wad. An attractive efficient cap, easy to open or close.

TRANSIT CONTAINERS: Hygrade transit cartons in two weights for each size of bottle are available (BRS approved), for individual dispatch if required.

COMPATIBILITY: *Ask Metal Box to confirm whether your particular product is suitable for packing in Poly-Tainers.*

The following list provides a general guide:

Detergents	Certain polishes
Cleaners	Many foodstuffs
Oil-in-water emulsions	Most water based products
Insecticides	Most acids and alkalis
Disinfectants not based on phenol or cresol	Distilled water
	Hydrogen peroxide

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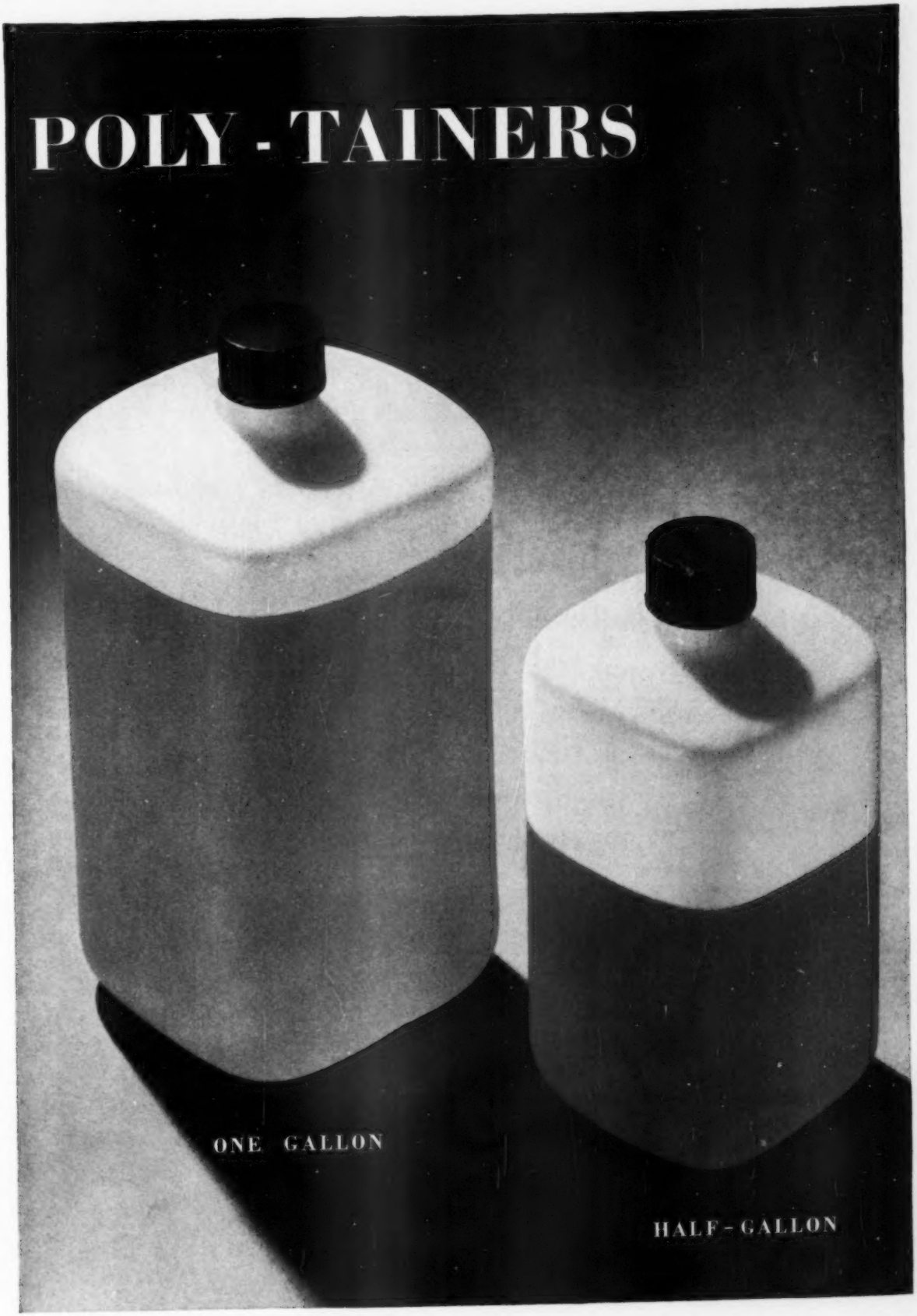
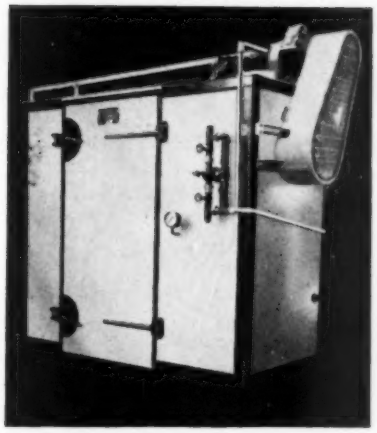

POLY-TAINERS
ONE GALLON
HALF-GALLON

too wet or too dry..

or just right



A Briggs single truck oven—one of the many steam, electrically and gas heated drying ovens in the Briggs standard range.

The weather in these islands is, of course, quite an unknown quantity—and certainly one which is utterly beyond the influence of ordinary mortals.

In fact there are few things which could be in such sharp contrast as the British weather and the highly developed science of controlled drying as it is understood by Briggs.

Briggs have perfected a wide range of standard drying ovens which is so comprehensive that it is almost certain to provide an immediate answer to the difficulties of every manufacturer who has a drying problem. A further virtue of standardisation is that it solves drying problems both quickly and economically.

Briggs also employ a highly competent technical staff who are fully qualified to answer any queries you may have, and advise on the best kind of equipment to install in those rare instances where specially designed ovens may be required.

THE SPECIALISTS IN COMPLETE DRYING PLANT

BRIGGS OF BURTON

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For

REMOTE CONTROL

of

chemical plant

Illustrated is a Plenty variable delivery pump, fitted with air controller and valve positioner to give accurate remote control of flow and pressure.

Similar units have been supplied to:

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Sodium Acetate anhydrous.

Sodium Sulphate anhydrous 98/100%

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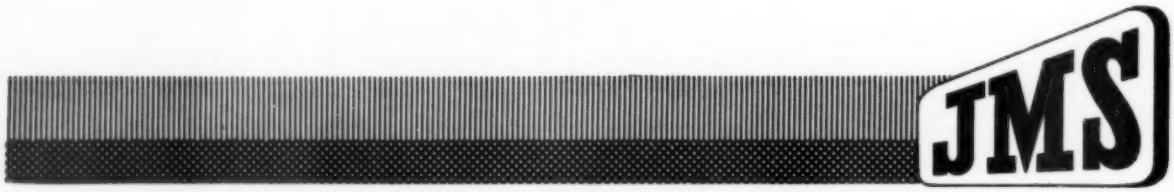

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This is the kind of container the housewife will be able to use again and again. She'll look out for them in the shops; when she buys the products these jars contain, make sure the labels they are carrying are *yours*.
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Call, write or 'phone Jacksons today—they will keep you fully informed.

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A comprehensive service embracing design and advice on glass containers, closures, labelling, display boxes and outers.
This service also offers to manufacturers, packing in containers other than glass, free market research facilities on 'design preference testing', 'container-in-use testing', and 'shelf testing', as well as an area test marketing service at a nominal charge.

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FLASHBACK
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ONE OF THE LARGEST MANUFACTURERS OF GLASS CONTAINERS IN THE UNITED KINGDOM

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Easy entrance, easy exit. Space-giving semi-forward control layout. Sliding doors make loading and unloading easy. Completely unobstructed access *across* and *through* the van. No bulkhead, wheel arch or engine hump in the way. Low floor level. *Easy handling.* All synchro gears. Steering, brakes and clutch all light and effortless. Comfortable driving position. Excellent vision. Easy parking. Small turning circle. *Easy engine access.* All components readily accessible to cut down service costs and time.

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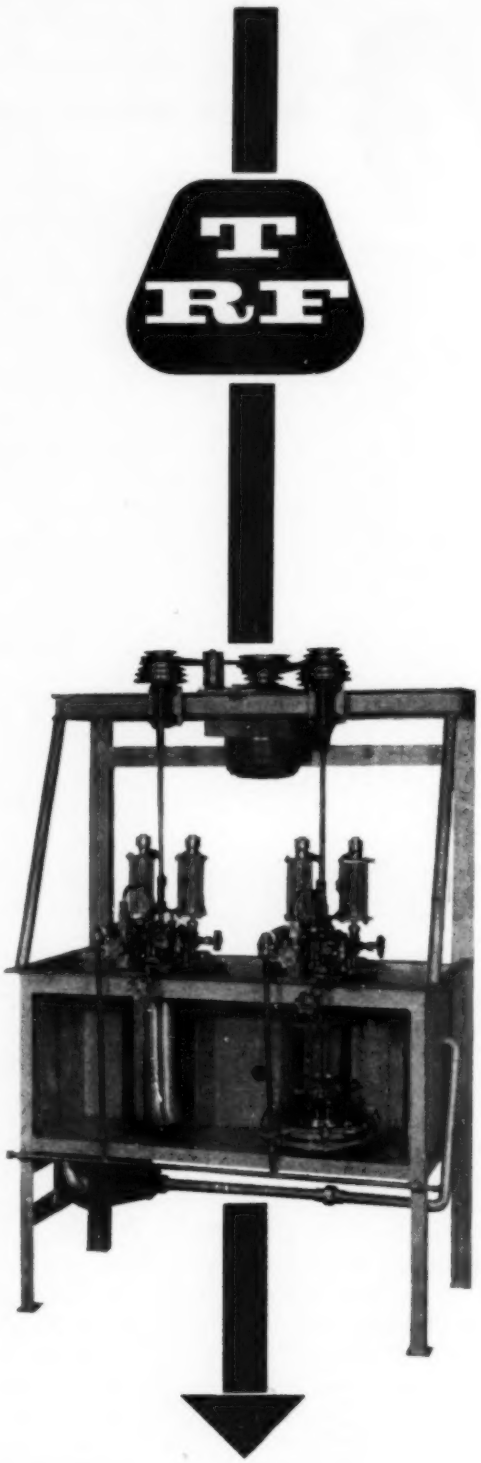
2 LOAD RATINGS	10/12 cwt 15 cwt	**2** WHEELBASES for each rating	90″ 102″	**2** CAPACITIES inc. 9 cu. ft. beside driver	144 cu. ft 171 cu. ft

ONE STEP AHEAD



Stop and consider. How can stainless steel help to improve *your* laboratory?

Take, for instance, the illustrated fermenter, showing alternative glass and stainless steel vessels, and based on a design by Professor E. B. Chain, F.R.S., the microbiology specialist. To T.R.F., the experts in stainless steel planning and production, this was yet another problem which called for their individual skills . . . the same skills which they can apply to *your* equipment problems. Better get in touch with them, soon!

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THE TAYLOR RUSTLESS FITTINGS CO. LTD.

GIV-TAN® F

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GIV-TAN F is easy to use. Being a miscible oil, it dissolves and mixes readily in all media normally employed for sunscreen preparations. As an oil it offers special qualities that enhance the cosmetic elegance of your product.

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GIV-TAN F is not an aminobenzoate nor does it contain other reactive groups and therefore is compatible with dihydroxyacetone.

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Upper Warlingham
2241/5

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Prominent pharmaceutical and food manufacturers in U.S.A., Canada and many other countries are already using these caps in very large quantities.

British manufacturers will find the following advantages of special interest:

- The cap when fitted becomes part of the glass container. It cannot be opened without showing signs of interference.
- The cap is simple to open — just tear off the removable strip by pulling the lug.
- The cap is captive, attached by a hinge to the clamping ring. It snaps shut providing a perfect closure throughout the life of container.
- The cap is suitable for all types of glass containers —bottles, jars and 'Trident' tubular vials.
- The cap may be used for pharmaceutical products, foods, soft drinks and for many other purposes.
- The cap is made of polythene. It is hygienic, non-corrosive, impermeable and unbreakable. Supplied in natural or coloured polythene, embossed if desired.
- Neck rings for bottle to accommodate the caps can be made at low cost to fit existing bottle moulds.
- Prices are competitive with normal capping and sealing processes.

We are the manufacturers of CAPTOCAP Tamperproof Snap-caps and the Sole Licensees for their use with glass containers in Great Britain. Write for our illustrated leaflet.

FITTING. CAPTOCAP Tamperproof Snap-caps are easy to fit by hand operated, semi-automatic or fully automatic machines. Existing capping machines can be adapted in some cases. We shall be pleased to advise manufacturers about their existing plant or supply information regarding special machines.

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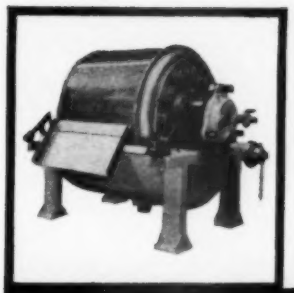

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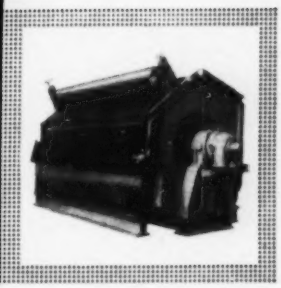

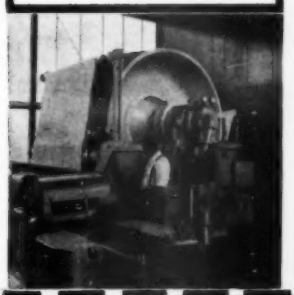

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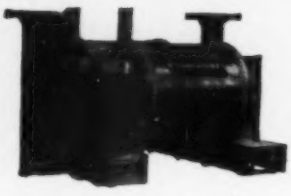
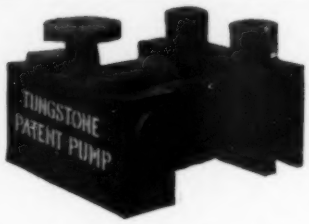
F 82

EBONITE PUMP, non-immersion type. Made in 3 sizes: 200, 375, 600 gallons/hour.



non-immersion LEAD PUMP. Made in 8 capacities: 375, 600, 800, 1,200, 1,500, 2,000, 3,000, 3,600 gallons/hour.



EBONITE PUMP, immersion type. Made in 3 sizes: 200, 375, 600 gallons/hour.

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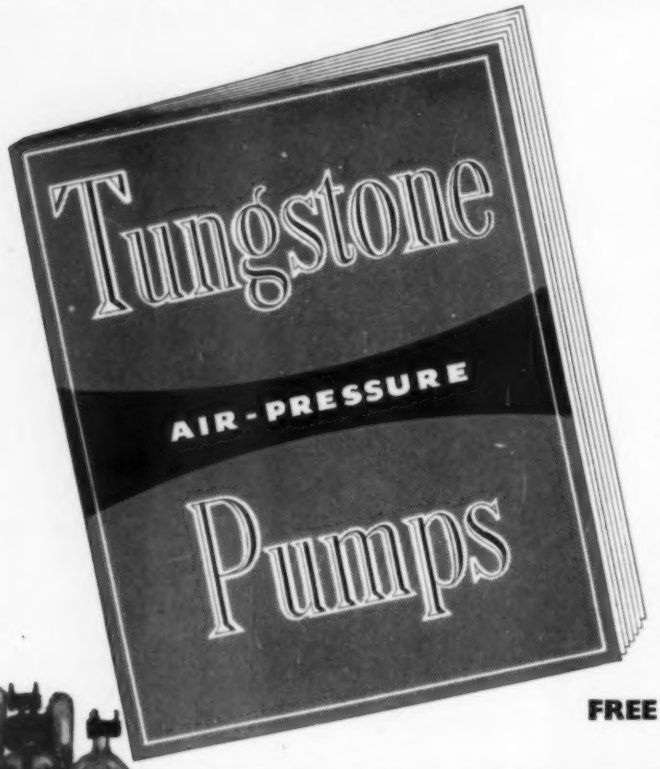

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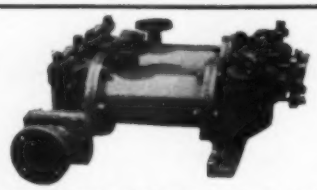

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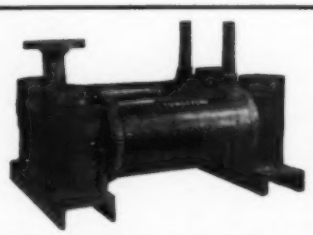

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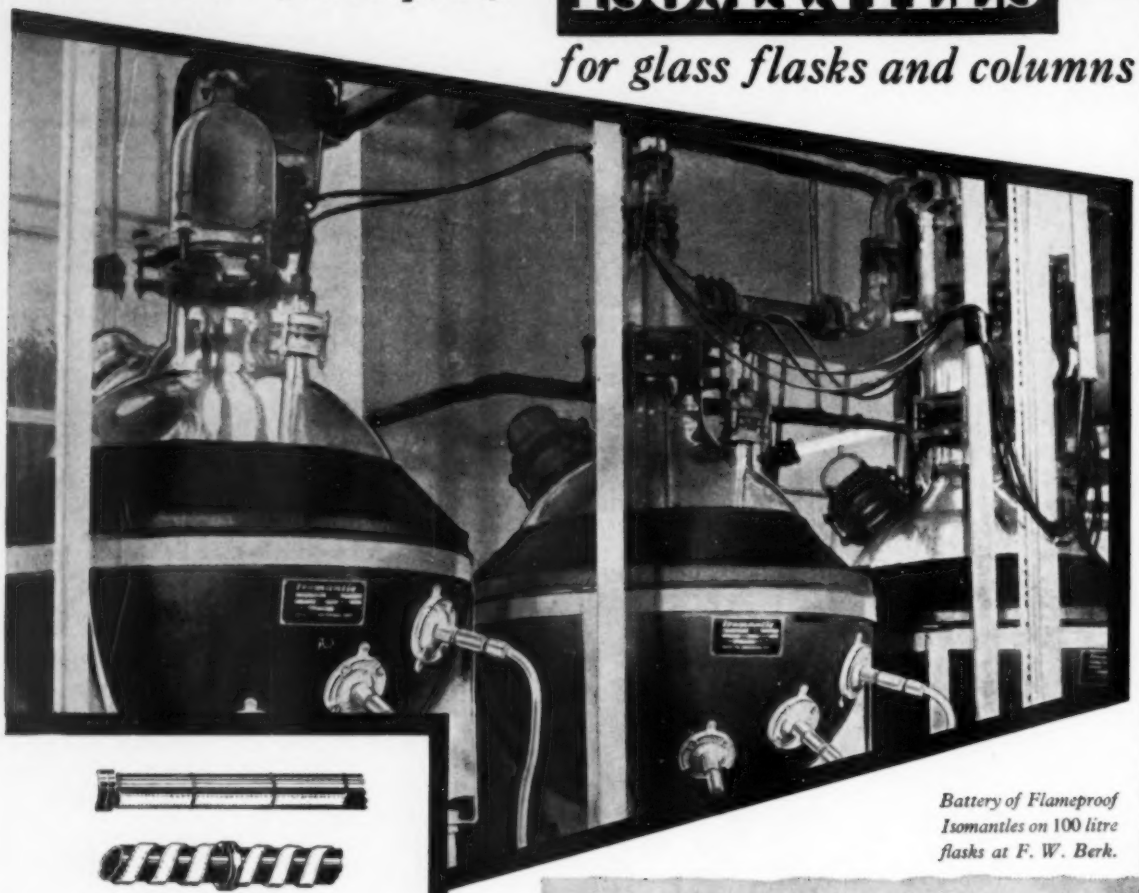

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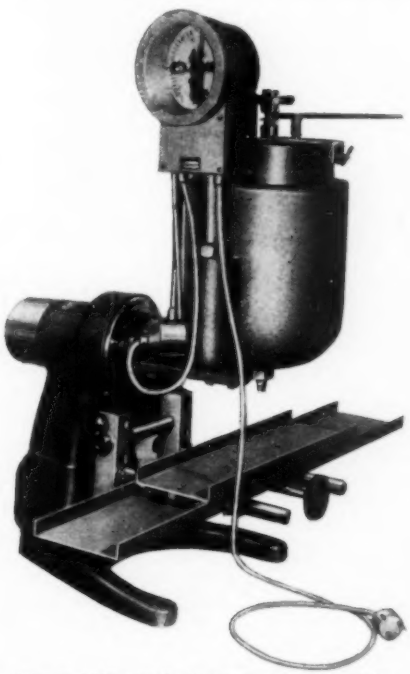

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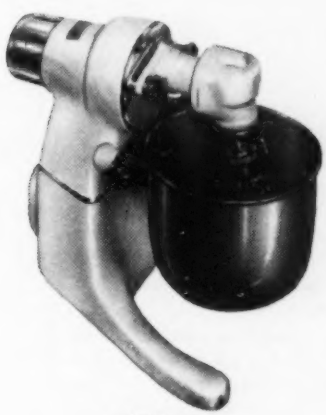

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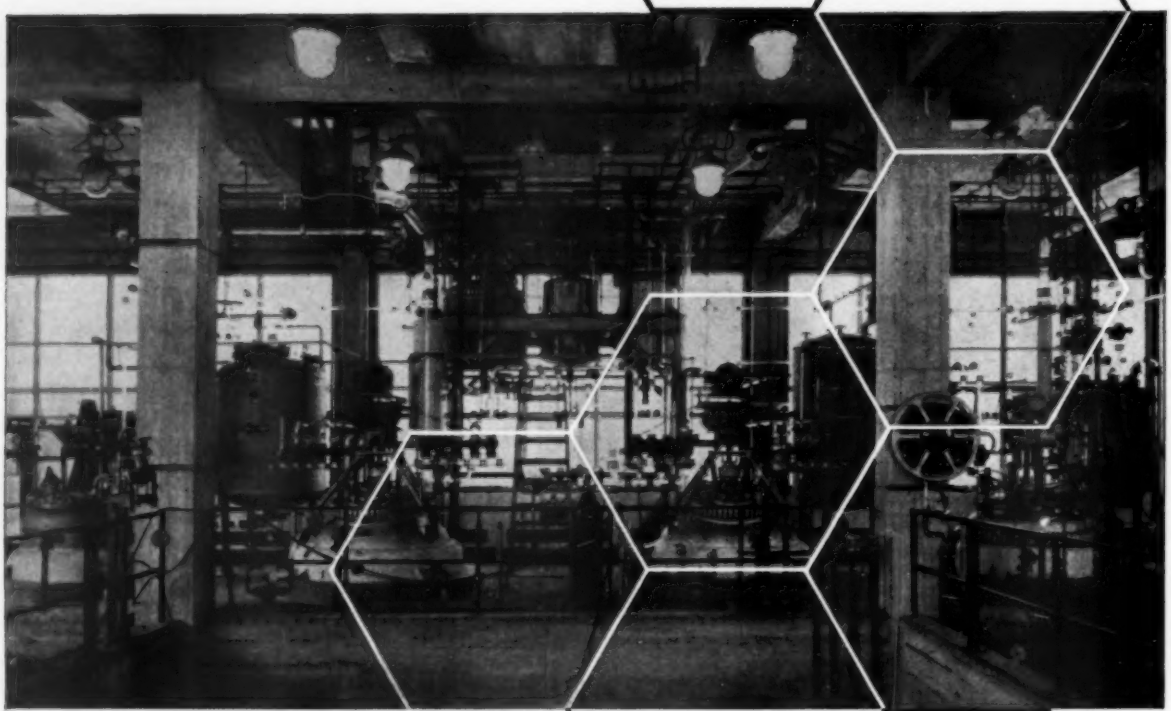

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Clear and colourless		
Free halogens		not detected
Specific gravity at 15.5/15.5°C		1.502
Distillation range (5—95%)		0.3°C
Residue on evaporation at 110°C	%	<0.001
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Acidity as HCl	%	0.0001

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MB 2

Development Chemicals from Heavy Organic Chemicals Division

NUMBER TWO

	NAME	DESCRIPTION	QUANTITIES AVAILABLE
	Alcohol		
1	Tridecanol	Liquid. Boiling range 240-267°C. Mixture of isomeric branched-chain C_{13} primary alcohols. Uses similar to those of lauryl alcohol as intermediate for surface-active agents. Also intermediate for plasticisers, synthetic lubricants, and oil additives.	*8 oz samples. Tonnage quantities.*
	Antioxidant		
2	'Topanol' CA	Solid. Antioxidant for polymers especially polyolefins, e.g. polypropylene and polymers of ethylene.	*Samples in 8 oz bottles.*
	Organic Acids		
3	Nonanoic acid	Liquid. B.Pt. 231-268°C. Essentially 3,5,5-trimethyl hexanoic acid. Intermediate for metal salts for use as specialty paint driers, gelling agents, catalysts, and rot proofing agents.	*8 oz samples. Evaluation quantities up to 10 lb.*
4	C_7—C_{10} acid	Liquid. B.Pt. 238-358°C. Mixture of saturated branched-chain aliphatic monocarboxylic acids. Intermediate for metal salts for use as paint driers, gelling agents, catalysts, and rot proofing agents.	*8 oz samples. Evaluation quantities up to 20 lb.*
5	Isophthalic acid	Solid. M.Pt. about 340°C in sealed tube. Intermediate in the production of alkyd resins and high quality polyester resins. Potential plasticiser intermediate.	*Samples in 8 oz bottles. Enquiries welcome for cwt lots.*
6	Trimellitic anhydride (Product of Amoco Chemicals Corporation U.S.A., supplied by I.C.I. in the United Kingdom only)	Solid. M.Pt. about 168°C. Intermediate for oil-soluble and water-soluble alkyd resins. The trifunctional structure gives high reactivity for production of unsaturated polyesters, plasticisers, and epoxide resins.	*Samples in 8 oz bottles. Small evaluation quantities.*

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	NAME	DESCRIPTION	QUANTITIES AVAILABLE
	Phenols		
7	Cumylphenol (*p*-(α, α-dimethlybenzyl) phenol)	Solid. M.Pt. 72-73°C. Intermediate for special oil-soluble, 100% phenolic resins for surface coatings of outstanding flexibility, durability, and resistance to acids and alkalis.	*Samples in 8 oz bottles.*
8	2,5-Xylenol (technical)	Solid. M.Pt. 60-70°C. Contains 80-90% by weight 2,5-Xylenol. Intermediate for varnish resins, plasticisers, adhesive resins, weedkillers, and antiseptics.	*Samples in 8 oz bottles. Quantities up to 1 ton from stock; larger quantities by arrangement.*
	Butylated Phenols		
9	3-Methyl-4, 6-ditertiary butylphenol (3M46B)	Solid, M.Pt. 56-58°C (technical quality). Intermediate for products used in the rubber and plastics industries. Other specialised uses.	*Samples in 8 oz bottles. Tonnage quantities.*
10	3-Methyl-6-tertiary butylphenol (3M6B)	Solid, M.Pt. 21-22°C (refined quality). Rubber chemical. Intermediate for rubber chemicals and synthetic perfumes, e.g. musk ambrette.	*Samples in 8 oz bottles. Tonnage quantities.*
	Propylene Derivatives		
11	Propylene dichloride (1,2-dichloropropane)	Liquid. B.Pt. about 96°C. Solvent for fats, waxes, and organic products. Chemical intermediate.	*8 oz samples. Ton lots.*
12	Dichlorodiisopropyl ether	Liquid. B.Pt. about 187°C. Solvent for fats, waxes, and organic products. Chemical intermediate.	*8 oz samples. 45 gal drum lots.*
13	Dipropylene glycol	Liquid. B.Pt. about 232°C. Polyester resin intermediate. Solvent, humectant, component in hydraulic fluids, and plasticiser for cork and paper.	*8 oz samples. Evaluation quantities by arrangement.*

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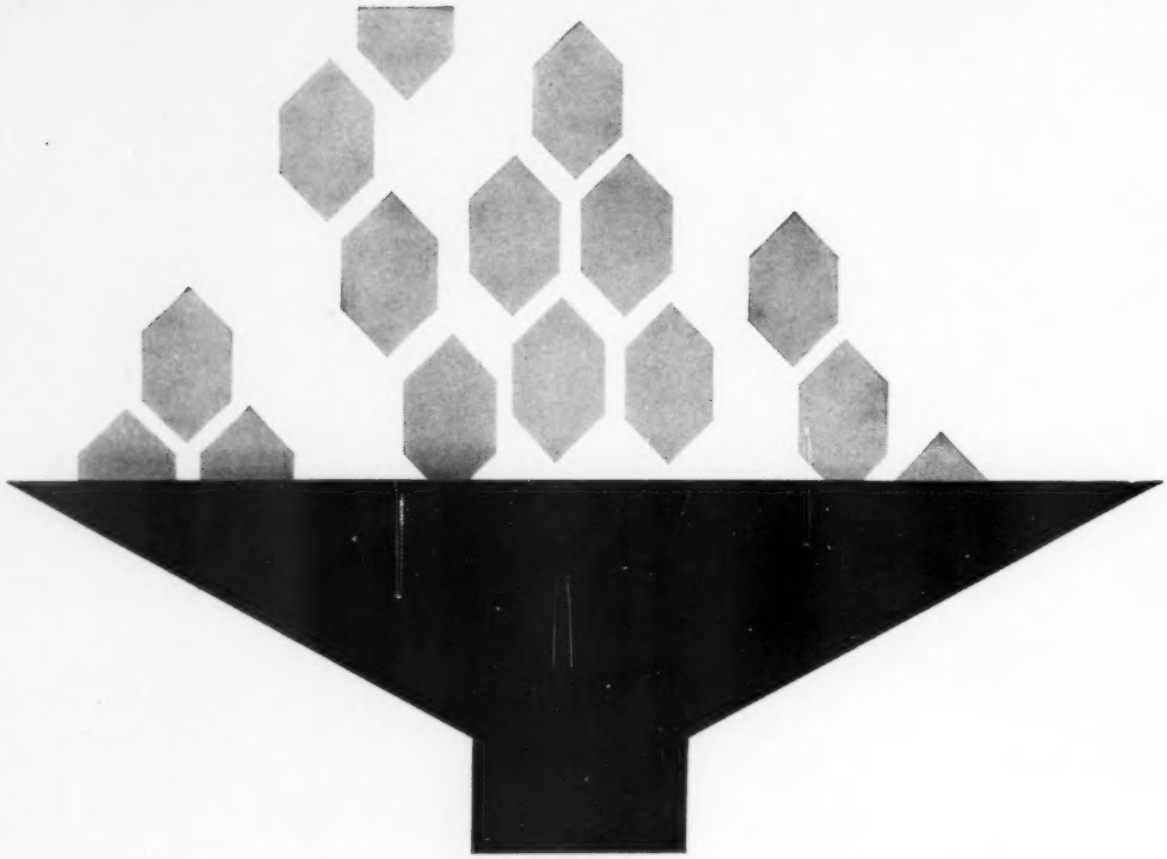

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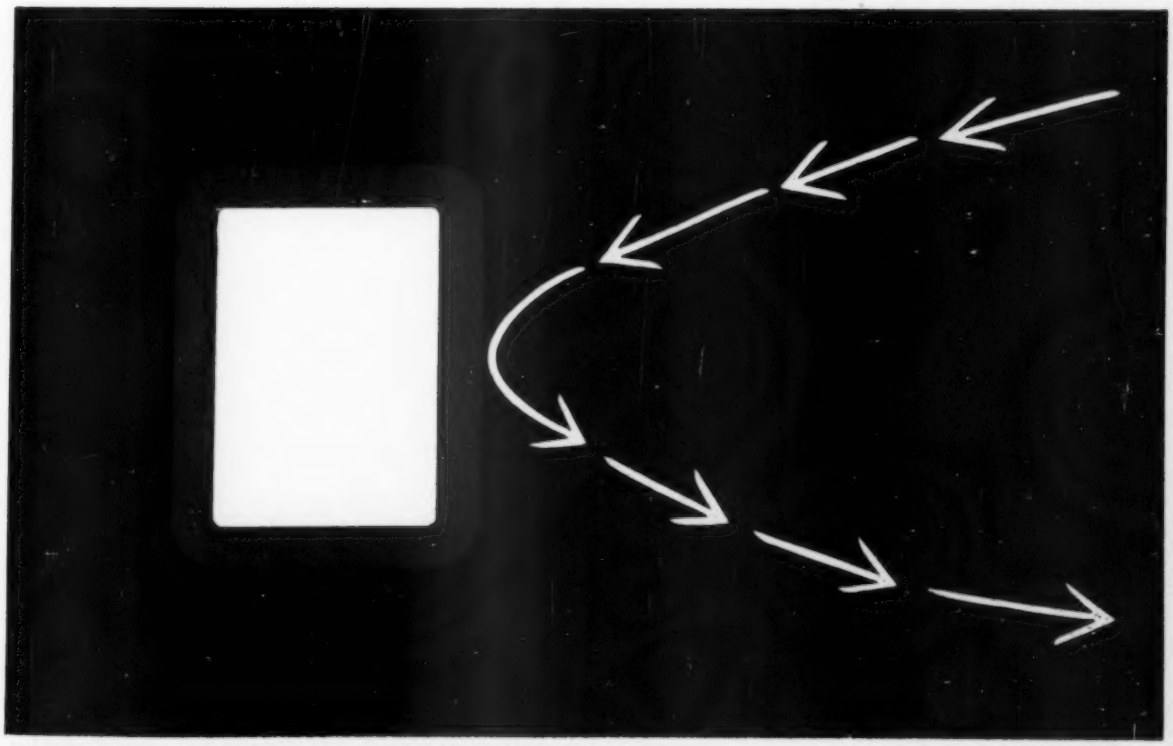

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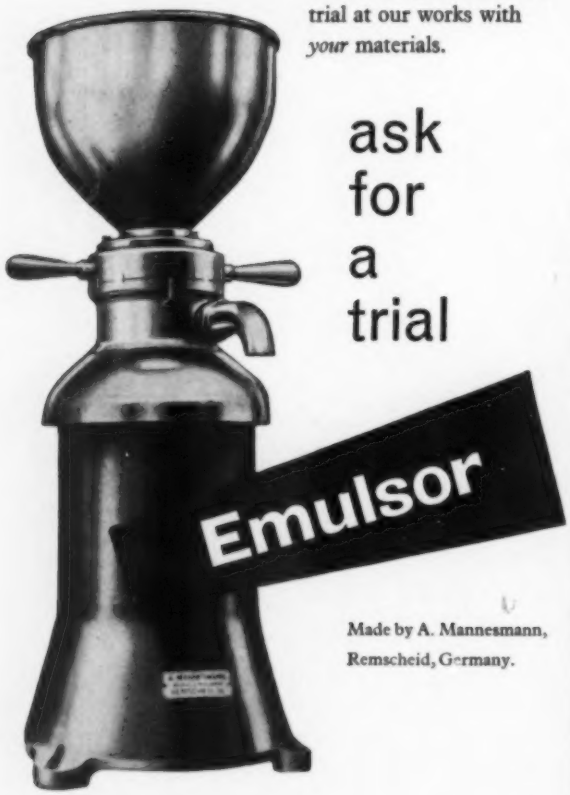

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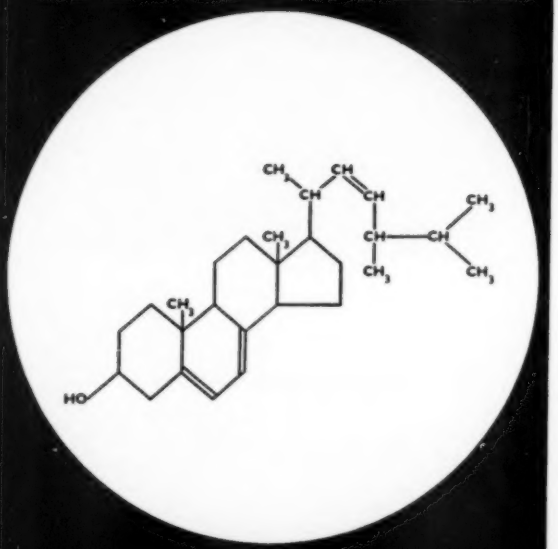

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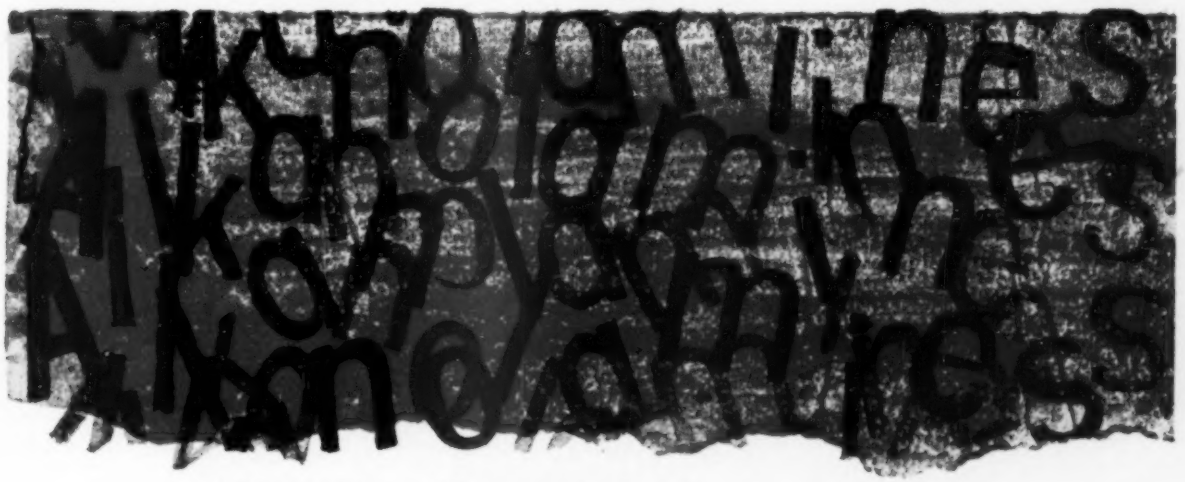

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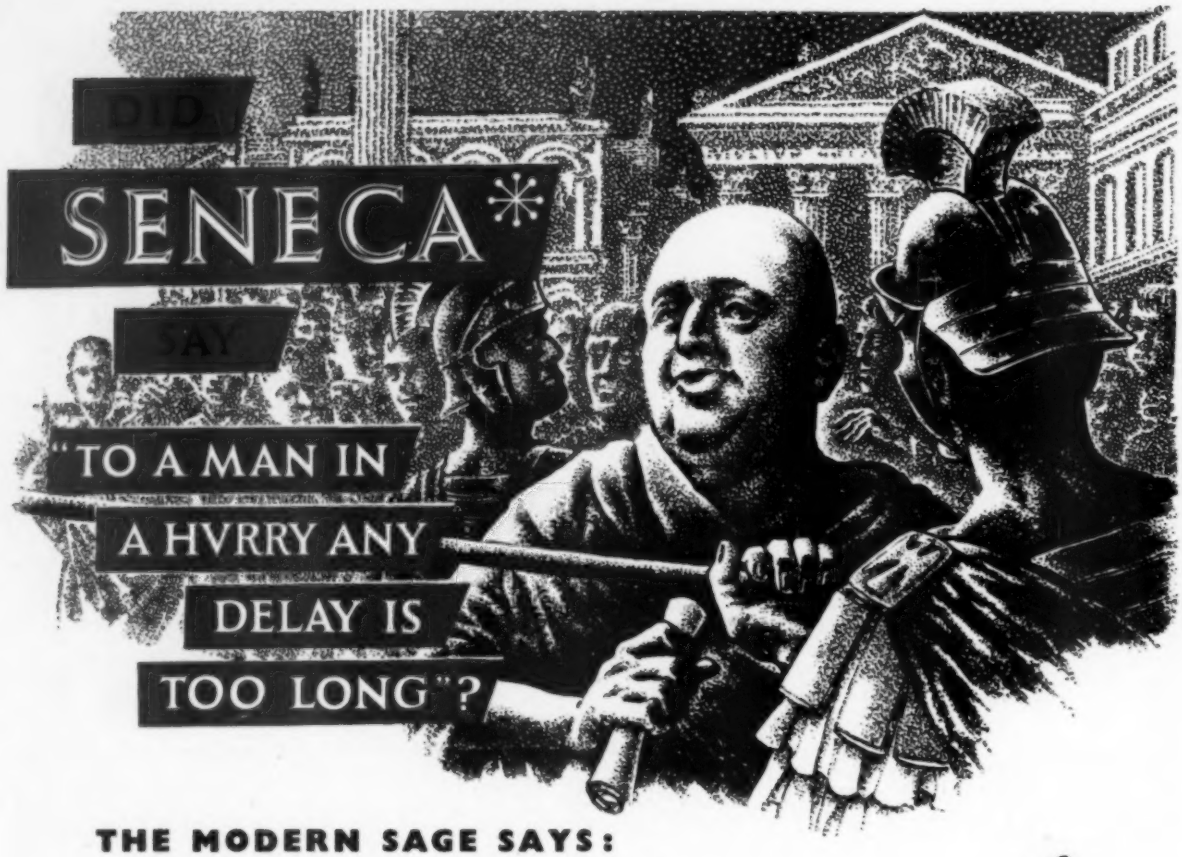

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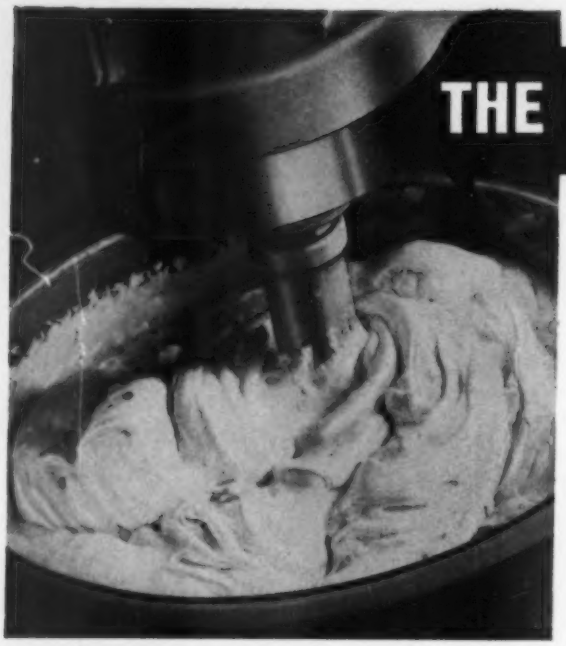

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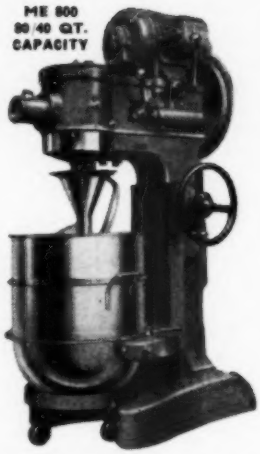

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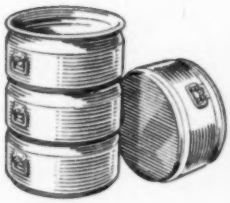

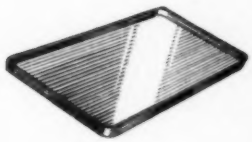

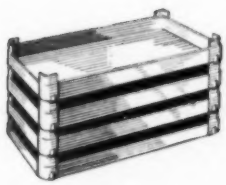

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Manufacturing Chemist

Editor: W. G. Norris

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Topics and Comments

Lowering the temperature

No subject generates more emotional exaggeration and misrepresentation in the House of Commons than drug profits and the Health Service. Some Labour M.P.s seem to think it downright immoral that profits should be made out of the Health Service. Yet these are the people who complain that we have to buy new drugs from abroad, ignoring the fact that our industry can afford to spend less than a tenth of the £70 million annually that the Americans spend on research. If the money for research is not to come from profits, where should it come from? These constant attacks on the industry also weaken its export trade, yet in spite of them drug exports climb from year to year (nearly 10% up last year to £44 million). Do the critics think the industry can continue to compete abroad if it is denied the funds to produce new drugs?

The most unfair criticism of all is that all the drug industry's profits come from the N.H.S. Most firms not only have substantial exports and income from overseas subsidiaries, but also operate in other markets such as veterinary medicines, animal food additives, fine chemicals and publicly advertised proprietaries.

To inject a little cool thinking into the heated Parliamentary debates, the Association of British Pharmaceutical Industry recently sent to all M.P.s a statement on the industry's activities and achievements. It quotes a Board of Trade figure of 1958 which shows that the output at manufacturers' prices totalled £163 million of which 34% went to the N.H.S., 27% to exports and the rest to other customers. So in rough terms about one-third of the profits come from the N.H.S.

One Labour M.P. recently alleged that an American firm had 600 representatives calling on doctors. In fact the total number of representatives employed by the industry is 2,400 of which about 1,600 call on doctors, the rest on chemists and hospitals. These representatives are qualified to discuss with doctors the uses, dosages, side effects and toxicity of their firms' products and to this extent they provide information that is generally welcomed. Promotional literature does the same job. Perhaps some firms are unnecessarily extravagant, but a recent A.B.P.I. survey showed that the total cost of direct mailing to doctors is about 3% of turnover. That the industry is anxious to eliminate improper promotional methods is proved by the formulation of its Code of Sales Promotion Practice which provides voluntary control of abuses.

By exercising voluntary discipline, by accepting regulation of its prices and by keeping its prices down (drug prices have risen less than 1% in six years against 13·1% for all manufactures), the pharmaceutical industry strives constantly to adopt the ethics of a public service while at the same time attempting to be commercially and scientifically viable and vigorous. It is a difficult and thankless task to perform in the relentless glare of publicity and controversy. We advise the politicians to lower the temperature for a while and let the industry get on with its job.

Still room for the minnows

The recent spate of takeovers of chemical and pharmaceutical firms is an intensification of a trend but not a novelty. The British government started what may be called the rationalisation of the industry in the 1914–18 war with the formation of British Dyestuffs. Then came the big mergers that created I.C.I. The yeast is still working and will go on working. Chemical industry today is increasingly very big business. As Dr. James Taylor pointed out in his Cantor lectures, for purely geometrical reasons large plants are more economical to operate than small ones; the capital cost per unit of output falls to a quarter for a tenfold increase in capacity. Large plants can also justify highly refined automatic control. The computer I.C.I. has ordered for its chemical plant at Fleetwood could only be justified by large-scale production.

Large organisations can also economise on sales and distribution costs. Above all they can earn the money needed to finance increasingly costly innovation. This can and does lead to monopoly; sometimes the sheer efficiency of the large firm gives it an unsought monopoly. But this does not necessarily eliminate competition, for industry now operates on a world scale and competition arises between national industries. The scale of resources needed for these titanic battles is indicated by I.C.I.'s venture inside the Common Market. A cool £100 million is being staked on the Rotterdam plants for making petroleum chemicals.

There are hazards in the creation of gigantic organisations. They can become flabby and complacent and ruthless. They are a problem of the age. But small companies can be just as susceptible to decay. It is not only the elephant which grows old and dies; little animals die much sooner.

Is there no place for the bright young man except in the big battalions? Must he become an organisation man? In fact there is still plenty of room for the innovator who wants to start off on his own. Over 60% of the gross output of the chemical and allied industries is still produced by small firms. There is still a place for the small, efficient specialist. The leviathans need the minnows and the minnows can themselves become leviathans.

Significance of synthetic peptides

Among the most important tasks facing research chemists is the synthesis of peptides. Peptides are proteins of low molecular weight, chains of amino-acids linked together and arranged in lines rather like the letters in a word or in a sentence. In the form, for instance, of hormones, regulatory substances, or antibiotics, these peptides exert a controlling function by directly intervening in metabolic processes. The vital significance of this function is illustrated by the fact that even extremely slight faults in genetic information or in the transmission of such information are liable to cause fatal diseases. Insulin, without which diabetic patients cannot be kept alive, is an example of such a peptide protein; this hormone has two peptide chains, one consisting of 21 and the other of 30 amino-acids.

The difficulty in producing peptides by artificial means lies in the fact that their synthesis involves an unusually large number of steps; what is more, the size of the molecules also makes it difficult to direct the chemical reactions along the desired lines, *i.e.* to prevent partially completed structures from being modified or even destroyed altogether.

The reason why so much time and money has nevertheless been spent on chemical research in an attempt to solve such problems is that, in their natural form, these substances only occur in minute quantities and that the few grammes obtained from the glands of hundreds of thousands of animals would prove far too expensive for medical use on a wide scale.

It was in 1953 that Du Vigneaud succeeded in synthesising for the first time a biologically active peptide. Its name was oxytocin, a pituitary hormone containing 9 amino-acids. For this magnificent achievement Du Vigneaud was awarded the Nobel Prize for Chemistry. Meanwhile, further great advances have been achieved in peptide chemistry; Switzerland, too, has made major contributions in this connection, especially in the fields of antibiotics (gramicidin) and regulatory substances (hypertensin and bradykinin).

The pituitary hormone ACTH (adrenocorticotropic hormone) is also a peptide. This hormone controls the secretion of important hormones from the adrenal cortex, including that of cortisone, which combats inflammation. It is hence hardly surprising that a great many research teams have been trying to synthesise this peptide in particular.

Towards cheaper hormones

In a paper presented at a meeting of the Natural Science Society in Zurich and since published in *Angewandte Chemie*, Prof. R. Schwyzer reported that in the course of research undertaken in the Ciba Laboratories he and his co-workers, W. Rittel, H. Kappeler and B. Iselin, had succeeded in synthesising a peptide with 19 of the 39 amino-acids contained in the naturally occurring hormone. One milligram of this synthetic substance displays a very high degree of activity equivalent to that of 20-30 international units. This proves that, although the chain consists of only 19 amino-acids (the synthesis required no less than 63 steps), it is already sufficient to exert an effect approaching that of genuine ACTH.

A similar synthesis was announced in November by an American team working at the University of California under the direction of C. H. Li. In this instance, too, the peptide synthesised contained 19 amino-acids and displayed a similar degree of activity. Finally, at the beginning of December, Prof. Klaus Hofmann, a Swiss chemist at the University of Pittsburg, reported the synthesis of a peptide with 23 of the amino-acids which go to make up ACTH. To complete the picture, in 1956 another Basle research team, led by R. A. Boissonnas, published an account of the synthesis of a peptide composed of 20 amino-acids; the activity of this preparation, however, was only equivalent to 2-3 international units.

The synthesis of the largest peptide molecule to date, an achievement in which a number of research teams have shared, can be considered an outstanding success for pharmaceutical research. It points the way to a more economical method of manufacturing ACTH in large quantities and justifies the hope that in the not too distant future it may be possible to provide the physician with a drug devoid of the additional substances contained in the natural hormone and hence devoid of the undesirable side effects which these are liable to provoke.

The I.C.I. touch for the railways

It seems that the Government has caught on to the idea of having scientists on top instead of on tap. The first chairman of the new British Railways Board comes from I.C.I.'s boardroom. He is Dr. Richard Beeching, a youngish (47) physicist who has served as technical director since 1957. There could be no more startling departure from the tradition of handing out big government jobs to retired generals and civil servants. Since he admits to having little knowledge of railways, Dr. Beeching has presumably commended himself to the Minister of Transport as a first-class manager. One can imagine the minister thinking: " If this is the kind of man who can make I.C.I. successful, then he ought to be able to do the trick for the railways." It is a bold step and a great compliment to private industry.

No less startling is Dr. Beeching's salary—£24,000 a year. This is what he draws at I.C.I. and it is £14,000 a year more than the salary of the present chairman of the Transport Commission. The salaries of I.C.I. directors have never been disclosed before. The net income on £24,000 is £6,536, which is only £1,800 more than the net income from a salary of £10,000. So the Inland Revenue claws back over £12,000 of the increased salary. Dr. Beeching is working for the Government in more senses than one.

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"THE modern concept of integrated materials management offers companies of every size and industry classification the opportunity to make their investment in production a profitable part of their business. But for optimum effectiveness all phases of the complex management of materials and production must be operated according to a systematic, comprehensive plan."

Do you understand what this means? It comes from a press handout issued by an organisation called Industrial Education International that is unleashing a troop of American experts to ginger up British managements. For 25 guineas, for instance, you can listen to a Mr. William A. Bocchino talk about "Advance Planning for Effective Production Control." We hope he uses shorter words than his copywriter, otherwise the ratio of information to explanation will be distinctly unfavourable. No doubt he has the benefit of the advice of another American expert, Mr. Gunning, "inventor of the Fog Index," who offers (at 15 guineas a time) to reveal the technique of "building a fog-free vocabulary."

Billingham by the Dead Sea

SINCE the establishment of the state of Israel a great deal of effort has been put into exploiting the chemical wealth of the Dead Sea. Recent developments, including the discovery of a natural gas well in the area, foreshadow projects that might make the Dead Sea the centre of the biggest chemical industry in the Middle East.

The Dead Sea is situated at the lowest point on the earth's surface, 1,300 ft. below sea-level. Geologists believe that at one time the sea covered a larger area and was at the same level or even higher than the Mediterranean. Due to deformations of the earth's crust, followed by evaporation, the Dead Sea settled to its present state many thousands of years ago. In winter, the lowest recorded temperatures in the area are 60°-75°F., but the high humidity, due to evaporation of the sea, has probably prevented its development as a spa.

The water of the Dead Sea is almost saturated, containing 23 to 25% of dissolved salts. It is estimated that they contain 2,000 million tons of potash, representing 23% of the world's resources and 1,000 million tons of bromine. Analysis of the elements present is roughly as follows:

Na	5 to 11%
K	1·6 to 1·85%
Mg	13·2 to 16·8%
Cl	65 to 68%
Br	2 to 2·7%

The high salt concentration makes the sea so buoyant that it is impossible to sink in it. The ancient cities of Sodom and Gomorrah are believed to be buried beneath the sea or near it and excavations are being conducted to locate them. The story of the "Pillar of Salt" may well have been the result of flooding followed by evaporation. The modern town of Sodom, where the extraction plant is situated, is not thought to be the site of the ancient city of that name.

A survey of the Dead Sea resources was made in 1883, but only during World War I did Great Britain show any interest, because all potash deposits were in German-held territory. Palestine was then part of the Ottoman Empire, which was a German ally. At the end of the war the British Government considered the matter more seriously and the Palestine Potash Co. was set up to exploit the minerals of the Dead Sea. A Russian engineer, Novomeysky, came to Palestine and applied his experience of salt extraction in Siberia to this problem. Legal difficulties were involved before the concession was granted to the company, but in 1930 a plant was built at the northern end of the Dead Sea and production of potash and bromine started a year later. In 1937 a second smaller plant was established at the south end and its products were shipped by barge to the north plant which was linked by road to Haifa. In 1948 the north plant was destroyed during the war with Jordan, and other Arab States and remained outside the territory allocated to Israel. The smaller south plant was expanded and continued to operate, but its products could not be exported until a road was built from Sodom to the Mediterranean. The south end of the sea is very much shallower than the north end, which may offer certain advantages in extraction. The Israeli Government acquired the major portion of the shares of Palestine Potash Co., the name being changed to Dead Sea Works Ltd.

Extraction processes

THE process of extracting the chemicals of the Dead Sea involves a series of fractional crystallisations, separating first sodium chloride and then carnallite. The mother-liquor contains magnesium chloride and bromide, from which bromine is liberated by chlorination. The bromine is absorbed in cold 30% sodium bromide, from which it is released by heating under slight vacuum; 90% recovery of very pure bromide is claimed. The potassium chloride is separated from carnallite by flotation. Potash (as KCl) and bromine are the chief exports of the Dead Sea Works. The former is used mainly in fertilisers. A very pure magnesite is also manufactured by the company for use in building materials.

Bromine production has been steadily increasing. In 1958 it was 1,000 tons per annum, while this year it is expected to be five times that figure. Apart from its use in the manufacture of bromides for the photographic and pharmaceutical industries, ethylene dibromide is the outlet for a large proportion of the element, which has been used widely in Africa and Asia as a powerful insecticide. EDB is also a petrol additive, being the solvent for "antiknock." Tetrabromoethane, made by bromination of ethane, is

used in ore-flotation, and dibromochlorophenol is a selective weed-killer. Recently, a subsidiary of the Dead Sea Works was set up at Beersheba with the aid of American and British firms to manufacture these and other bromides. The ethane is brought from the refineries at Haifa.

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Even such an established product as lipstick has got more popular since 1955. At least nine out of ten women under 45 use it regularly. And 61% of women aged 45-60 use it today against 46% in 1955. Liquid make-up is gaining favour, while rouge is steadily declining. Again Max Factor has made great headway with liquid make-up.

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The mechanism of size reduction is complex. Most machines utilise crushing, impact or shear forces and in many cases a combination of two or more of these forces. The development of machines for the purpose of pulverising solids appears to be the result of experience, and it would seem to be a matter of "know-how" or previous knowledge which chooses one machine in preference to another for grinding a particular solid or obtaining a special size distribution. Just as their method of manufacture may influence the shape or size of particles, so the various types of mills tend to produce their own characteristic shape, a ball mill producing a less angular body than a hammer mill.[1] However, although a particular particle shape may be better produced by one type of mill rather than another, considerations of wear on machinery may be the final deciding factor.

If a product is required which is all less than a certain specified size, then sufficient grinding will normally produce this, but if the product is to conform to a maximum and a minimum size, then difficulties arise, irrespective of the type of mill used. In addition, variations in the charge of drug placed in the mill will affect the size distribution.

Size reduction utilises energy very inefficiently. Only between 0·1 and 2·0% of the energy supplied to the machine appears as increased surface energy in the solid.[2,3] Owens[4] carried out some investigations into the way in which energy was utilised in a crushing machine and concluded that it was dissipated in the following ways:

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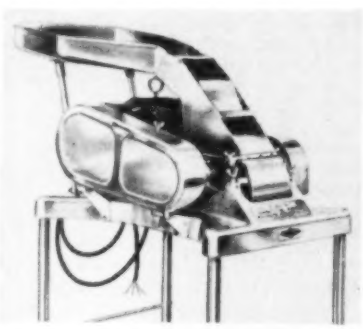

Fig. 1. The Manesty Fitzmill model D comminuting machine.

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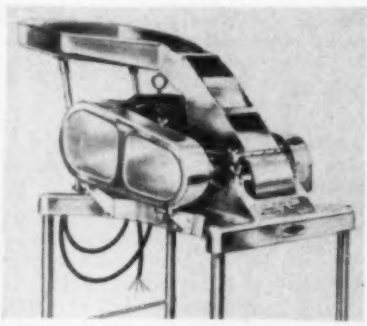

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fracture occurs is not known, but it has been suggested[5] that the applied force produced small flaws in the material, and provided that the energy was sufficient the flaws expanded and branched and the particle disintegrated.

The rate at which the force is applied is important—the greater the rate, the less effectively is the energy utilised, and it has been shown[6] that slow compression crushing produces a larger surface area than drop-weight crushing.

Size reduction can be done either dry or wet. The advantages of wet grinding are:

(*a*) Power consumption is reduced by about 25%.
(*b*) The amount of "fines" produce is reduced.
(*c*) Dust is eliminated.
(*d*) The product is more easily handled.
(*e*) The machine capacity is increased.

Its disadvantages are:

(*a*) Wear on machinery is increased.
(*b*) Physical and chemical changes may take place in the presence of water.
(*c*) The product usually has to be dried after grinding.

Size reduction machinery is conveniently divided into the following classes:[3]

	Feed size	*Product size*
Coarse crushers	150-4 cm.	5-0·5 cm.
Intermediate crushers	5-0·5 cm.	0 5-0·01 cm.
Fine crushers	0·5-0·2 cm.	about 200 mesh (0·01 cm.)
Colloid mills	80 mesh (0 02 cm.)	down to 0 01 micron

Types of crushing equipment

Coarse crushers. These will not be considered as the product size is outside the range required by pharmacists.

Intermediate crushers. This group includes most of the machines used in the pharmaceutical industry, *e.g.* edge runner, end runner, hammer, pin and cutter mills.

Fine crushers. This group includes roller, ring roller, tube, vibratory and revolving ball mills.

Colloid mills. These machines have been dealt with under Emulsifying Machinery.[7]

INTERMEDIATE CRUSHERS

(*a*) **End runner mill**

This mechanical pestle and mortar utilises crushing and shear forces and is a suitable machine for many dry or wet grinding operations. Scraper knives remove the material from the sides of the mortar and pestle and throw it under the pestle as it revolves. The mill is capable of dealing with crystalline and fibrous materials, needs very little attention and is easy to clean. It is not totally enclosed so that it cannot be used for obnoxious drugs.

Pascall Engineering Co. Ltd. make four sizes of end runner mills with mortar sizes ranging from 7 in. to 20 in. Pestles and mortars are made in either ceramic, cast iron or stainless steel.

(*b*) **Hammer mills**

The hammer mill consists of a high-speed rotating disc to which are attached a number of hammer heads. These hammer heads are free to move and swing outwards under centrifugal force as the disc rotates. The material to be crushed is fed in, either at the top of the disc or at the centre, thrown outwards by the revolving disc and broken by striking the hammer heads and the casing of the mill. Breaker plates may be fitted around the periphery of the cylindrical casing to take the impact of the material which has been struck by the hammers. Size reduction is thus obtained by impact forces.

The material is retained in the mill until it is small enough to pass through the meshes of a screen which forms the lower part of the casing. Since the particles on their passage to the screen follow a path which is roughly tangential to the rotor, the effective screen perforation is much smaller than the actual opening. Thus it is possible to obtain a fine particle size with a relatively coarse screen. The screens are usually of the round-hole type or of a herring-bone pattern. The round-hole type are subject to clogging with very fine powders. The herring-bone slotted screens do not suffer from this defect but are limited in their usefulness for grinding fibrous materials as the fibres may align themselves with the slots and pass through.

The hammer heads can be replaced by either fixed or swinging blades. Most blades have two hardened faces, one flat for grinding and dispersion and the other knife-edged for cutting and granulating powders. In some machines the rotor assembly has to be reversed in order to use the opposite edge of the blades and in others the direction of rotation of the motor can be reversed.

The Apex comminutor junior No. 160 can be used for size reduction under both wet and dry conditions and also size enlargement or granulation. Eight types of screens, each made in a number of different sizes, are available and they are easily and quickly fitted in the grinding chamber. A wide selection of blades is also available for the rotor.

The comminutor is normally equipped with a fixed speed motor of 3,000 r.p.m. but a slower speed machine is available for granulation and a higher speed motor can also

Fig. 2. Laboratory 8 in. grinding mill made by Christy and Norris. The bag is detachable from the metal frame which is clipped with the bag to the underside of the mill. A few grams of material can be processed with relatively little loss in this machine.

be obtained. A special switch fitted to the motor enables the direction of rotation of the blades to be reversed without dismantling the machine and altering the comminuting blades.

A larger comminuting mill, No. 214, possesses a number of additional advantages. It is available either with a variable-speed drive or with three fixed speeds. The mill can be water-jacketed to process heat-sensitive materials and the feed size can be much larger than ½ in. As in the junior mill the motor can be reversed by means of a switch.

The Manesty Fitzmill (Fig. 1) is similar to the Apex No. 214 in that it is a three-speed machine, but the reversed action of the blades is obtained by removing the rotor, turning it round as a single unit, the direction of rotation of the motor remaining constant.

The Christy and Norris range of comminutors are high-speed mills with a rotor consisting of a rigid four - armed beater - cross. The machines are thus limited in their application, but they are simple to operate and occupy very little space. The laboratory models are made in two sizes, a 5-in. and an 8-in. mill (Fig. 2). Maximum feed size is about ⅜ in. and it is possible to process a few grams of material in the smaller machine with a relatively small loss.

The Microid Atomill (Griffin and George Ltd.) is a small hammer mill which has the advantage of being totally enclosed (Fig. 3). Feed material must not be larger than 8 mesh and this is passed into the grinding chamber by a hand-operated feed screw. Knives and blades are not available for use with this machine and using a single-speed motor limits its usefulness.

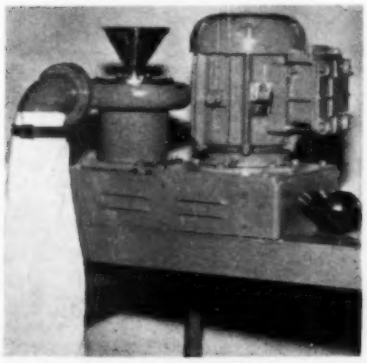

Fig. 4. The Minikek grinding mill is the smallest in the range of Kek pin disc grinders.

Fig. 3. The Microid Atomill, a small hammer mill made by Griffin and George Ltd. It has the advantage of being totally enclosed.

(*c*) Pin mills

The Minikek grinding mill (Fig. 4) is the smallest machine in the range of Kek pin disc grinders and is suitable for handling small quantities of material. The mill consists of two circular metal discs of heavy construction studded with strong metal pins set in concentric circles, openly spaced near the centre but gradually closing up towards the perimeter. The lower disc, with the pins pointing upwards, revolves on ball bearings at a high speed. The upper disc is stationary with the pins pointing downwards and fitting into the spaces between the circles of pins in the revolving disc. The material to be ground is fed into a hole in the centre of the upper disc and it is carried by centrifugal force by the lower disc through the network of pins and discharged on the periphery. The absence of screens and grids eliminates stoppages through clogging, and the fanning action of the rapidly revolving pins keeps the material cool and aerated. The fineness of the powder can be controlled by changing the pin discs. The mill is particularly useful for grinding low melting-point materials but not recommended for the reduction of abrasive materials nor for resilient substances such as fibres, cork, etc.

(*d*) Cutter mills

Size reduction in a cutter mill takes place almost entirely due to shear forces and this, it is claimed, results in a more uniform product than with other types of mills. A central rotor has, on its periphery, a number of knives and these pass close to fixed knives mounted on the stator. By adjusting the setting of the stator knives the gap between the fixed and movable knives can be varied. These types of mills are especially suitable for fibrous materials, and as they are comparatively low speed mills very little heat is generated during the processing.

Apex make two cutter mills for laboratory use. The larger model, 116A, has an 8-in. grinding chamber and the rotor speed can be varied from 400-1,200 r.p.m. Model 116AA has a 2½ in. grinding chamber and three fixed rotor speeds, 900, 1,800 and 3,750 r.p.m. Model 116A has a safety switch incorporated in the chamber front so that when the door is open the motor will not start. The smaller model does not possess this safety device, but the front of the chamber is made of perspex and held in place by two spring clips. This makes it possible to observe the milling while it is in progress.

FINE CRUSHERS

The mills most suitable for small scale use are the ball mills. These mills consist of a pot into which is placed a charge of balls and the material to be pulverised. The pot is then shaken or rotated, the movement of the balls inside powdering the material. The pot and balls are commonly made of acid-resistant porcelain, but for abrasive materials steel balls and pot will be required.

In the vibratory ball mill the pot with its charge is held in a spring mounted cradle so that it cannot revolve and is forced by a rotating shaft which is unevenly weighted to trace out an eccentric path about its position of rest. The balls inside the pot are thrown about and due to their rapid movement reduced the particle size of the material.

In the revolving mills the pot is allowed to rotate as a cylinder on a horizontal axis. When operated correctly the balls are carried up the side of the pot until their weight overcomes the centrifugal force and they cascade down over the other balls grinding the material in the process.

The speed at which a mill is rotated is important and for economical operation the proper speed for a particular process and mill must be found. Each mill has its critical speed. This is the speed at which the grinding medium is held against the mill walls by centrifugal force which just balances the weight of the ball acting downwards, that is when

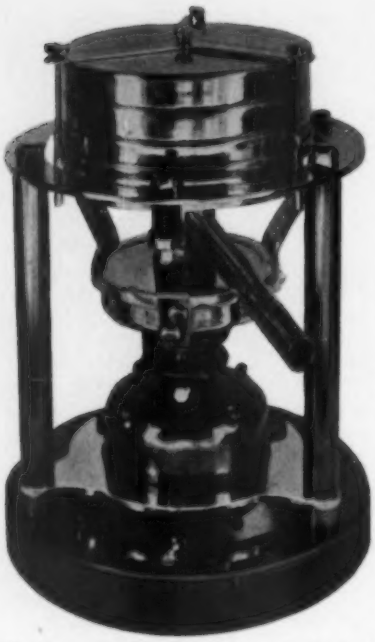

Fig. 5. The Finex sifter made by Russell Constructions Ltd. for batch or continuous operation.

$$Mg = \omega^2 r M$$

where ω = angular velocity
r = radius of one of grinding elements
M = mass of one of grinding elements
g = acceleration due to gravity.
all in consistent units.

For a ball mill of effective diameter D ft., rotating at the critical speed of N revolutions per second

$$Mg = \frac{2(\pi DN)^2 M}{D}$$

If the speed of the mill is given in r.p.m. this formula reduces to

$$\text{Critical Speed} = \frac{76{\cdot}63}{D}$$

The energy supplied to the balls in the vibratory mills is greater than in the revolving mills so that normally a finer powder can be produced in a shorter time using a vibratory mill. But this larger energy input means more heat generated and consequently vibratory mills cannot be used for heat-sensitive materials. Ball mills can be used for wet or dry grinding and since the system is totally enclosed they can be used for obnoxious drugs. The grinding material is cheap to replace and the mills are suitable for all degrees of material hardness.

Griffin and George make a vibratory mill convenient for small-scale use and Pascall Engineering Ltd. manufacture a range of revolving mills.

Size separation

Size separation is a necessary pharmaceutical process in order to obtain controlled and reproducible conditions. Sieves are the means whereby most of the grading of powders is carried out on a small scale, but it must be remembered that cyclone separators, magnetic and electrostatic separators and riffled tables are types of machines which are frequently used on a large scale.

Sieves or screens are useful for a particle size down to $\frac{1}{800}$ in. (300 mesh). Below this it becomes difficult to manufacture meshes which are fine enough and yet of sufficient strength. In addition the finer the screen the more readily it becomes clogged.

Isodiametric particles will only pass through a screen if the size of the aperture is large enough. Elongated particles, however, can come to rest on either one of two sieves depending upon their maximum length and diameter. If the sieve is vibrated in a horizontal plane only, then the length of the particle is the main factor which decides upon which screen the particle will rest. If the distance from the centre of gravity of the particle to its end is less than the mesh size the particle will tilt, and providing the mesh size is larger than the diameter of the particle it will fall through. If, however, the movement of the sieve has both vertical and horizontal components, then the diameter of the particle will decide the resting place of the particle. Since the diameter of fibres from organised drugs is much smaller than their length, the screen analysis of such a powder will depend upon the type of screening action of the machine used. In all cases the amount of material on the screen must be small, otherwise the small particles will be obstructed by the larger and retained on a screen through which they would normally pass.

Screening can be carried out wet or dry. In wet screening the material is washed across the screen and clogging is prevented. The fine powder is separated from the coarse and a better size separation is obtained. The main disadvantage, of course, is that the material may have to be dried afterwards. Hydrolysis of some active constituents may also take place during wet screening.

If the movement of the screens is too vigorous, then size reduction may take place and, in addition, damage might be done to the screens themselves.

The Finex sifter (Fig. 5) uses screens to which a gyratory movement of large intensity and small amplitude is given by means of a vertical shaft and eccentrically loaded fly-wheel. The movement of the screens is mainly in a horizontal plane and consequently they are liable to clogging with certain types of powders. The machine is fairly quiet in use, suitable with wet sieving and also for batch or continuous operation.

The Inclyno test sieve shaker (Fig. 6) employs both horizontal and vertical movement of the sieves to separate the material. The sieves are placed on a platform which rests on a circular rotatable collar which gives the sieves a slight tilt from the vertical. The angle of inclination to the vertical remains constant, but as the collar revolves the plane of inclinations turns with it and the material is spread over the sieves.

(Continued on page 158)

Fig. 6. The Inclyno test sieve shaker made by Pascall Engineering Ltd. employs both horizontal and vertical movement.

Russia Plans to Increase Perfumery Production

By P. W. Sherwood

In recent months Russian perfumes have made their appearance in Western countries, including Britain. Some of the brands to be exported in 1961 include "Red Moscow," "Treasure Chest" and, almost inevitably, "Sputnik." Russia's perfume industry is briefly described in this article.

RUSSIA'S seven-year plan, promulgated in 1958, provides for a 1965 output of all perfumery chemicals and oils at 65% above the 1958 level as follows:

	1958 output (metric tons)	*Increase, 1965 versus 1958*
Natural oils	899	59·7%
Synthetic perfumery materials	2447	69·5%

This will be the steepest rate of increase since the immediate post-war period, when Russia was hard-pressed to recover the production of perfumery materials which had been lost as a result of World War II. Physical destruction and territorial occupation during World War II caused a decline to 7% of pre-war level (48 tons in 1946 versus 646 tons in 1940), and it was only in 1952 that the pre-war position was regained. Similarly, output of synthetic perfumery materials dropped from 634 tons in 1940 to 370 tons in 1946, a reduction of 52%.

As in all countries, the Russian perfumery industry is using more synthetic raw materials than natural oils. Average annual growth rate of synthetics has been 13% during 1951-58. During this period these materials constituted between 72 and 79% of all perfumery materials consumption. By comparison, synthetics made up only 57% of the total in 1940. The present ratio is projected into 1965, when synthetics are forecast to make up 78% of total perfuming agents. However, there is considerable effort devoted to the synthesis of oils which are currently obtained in the U.S.S.R. from natural sources (mint oil, menthol, citronella oil, etc.).

Naturally, the proportion of synthetics in the overall perfume formulation differs widely by product; the following percentages are given for 1965:

Dental preparations, 2·5%; synthetic perfume materials, toilet soaps, 82%; synthetic detergents, 90%; various food essences, 80%; perfumes, 80%.

Table 1 gives a more detailed use pattern.

Table 1. Composition of perfumery components of Soviet products in 1958

	Mean content % in the Perfume Portion of —			
	Perfumes	*Toilet Soaps*	*Cosmetics*	*Food Essences*
Natural essential oils	20·8	15·0	63·2	15·8
Synthetic compounds:				
Simple and complex esters	27·6	40·4	10·0	73·7
Alcohols	25·4	28·4	18·0	0·3
Aldehydes	13·6	1·0	3·0	8·9
Ketones, lactones and other synthetics	11·4	8·5	5·6	1·2
Miscellaneous	1·2	6·7	0·2	0·1
	100·0	100·0	100·0	100·0

Table 2 shows how the production of synthetic perfumes has varied over 18 years.

Table 2. Synthetic perfume production

Type of Product	*% of 1940 output*	*% of 1958 output*
Simple and complex esters	44·5	55
Alcohols	37	24
Lactones, ketones, etc.	9	8
Aldehydes	9·5	13

The number of synthetic oils now available to the Russian perfume industry is still fairly limited. In 1959, 120-130 different kinds were offered. This compares with 250-300 types available to producers in the U.S. and Western Europe. Russia turned out 45 different esters in 1958, while the Dutch firm "Naarden" alone listed 110 esters.

To remedy this situation of insufficient variety, much Russian activity has been reported. During the immediate post-war period production was begun of some 20 new synthetic essential oils, among them hydrooxycitronellal, sandalidol, tibetol, cyclamen-aldehyde, oil of citronella, etc. Special emphasis has been placed on expanding the production of synthetic products which had previously been imported, such as vanillin (1958 output was 6·6 times that of 1940), heliotropine (35 times), isoeugenol (7·6 times), anisaldehyde (28 times), etc.

At the same time, progress is reported toward reducing the cost of making synthetic perfumery materials. I. M. Torbin reports the following average breakdown for cost of production of such chemicals during 1958 which, to say the least, shows remarkable figures.

Table 3. Cost breakdown for synthetic perfumery production

	%
Raw materials	90·8
Auxiliary materials	0·8
Heat and electricity	1·3
Labour, including benefits	4·2
Amortisation	1·3
Miscellaneous costs	1·6
	100·0

Unit production costs are being improved by increasing plant size and by installing more extensive automation and instrumentation. However, the main cost reduction potential clearly exists in decreasing raw materials consumption. A recent article in *Ekonomoka Khimicheskoy promishlennosti* (Economics of Chemical Production) reports progress in some synthetics (Table 4).

As yet there is no commercial production of synthetic citral or ionone on the basis of such less expensive raw materials as isoprene, acetone and acetylene. Syntheses of this kind are practised industrially in the U.S. and Russian research is directed toward this objective in order to reduce the demand for costly oils of coriander and of citronella which serve as raw materials at present.

An improvement in the quality of

perfumery agents is called for by the current seven-year plan. For example, products with the odour of lilac are widely favoured in Russia. It is felt, however, that the available terpineols on which the lilac scent is based are not adequate for the production of the more sophisticated kinds of perfume. Accordingly, the line is to be extended by the production of stable oils extracted from lilac flowers which are suitable for extensive cultivation in many areas of Russia.

Along the same line there are only two products currently produced with the odour of jasmine, namely benzyl acetate and jasmone. To round out this line it has been necessary to import 5-6 tons of other jasmine-scented products yearly. Of late there has been some Russian pilot work on the production of dihydrojasmone and a material known as "Jasmone 7," and there is some pressure for early commercialisation of additional jasmine-scenting agents.

On a constant price basis, the output of all perfumery materials rose 2·8 times during the years 1940-58, but the production of perfumes and eau de colognes increased 8·6 times. Present distribution of all essences in end product fields is estimated, *on a price basis*, as follows:

	%
Perfumes and colognes	60
Cosmetic products	25
Toilet soaps	15

This shift toward the more valuable products has meant replacement of some of the less costly natural scents by more expensive synthetic products. This change has not always been for the better, however, and Torbin complains that substitution of synthetic perfumes for natural products in certain toilet soaps has sometimes led to an inferior product. This is largely due to the use of too high a percentage of complex esters, many of which are unstable in alkaline medium.

Despite these occasional shortcomings, however, there appears to be a general uptrend in the quality and range of perfumery materials and essences available in the U.S.S.R. The main emphasis of research effort in this field is toward improving present production methods and toward the development of methods of synthesis which will broaden the base of the perfumery industry and which will decrease the dependence on natural essential oils and on imports of special ingredients.

Table 4. Consumption of raw materials in perfume production

Synthetic	*Raw Material*	*Raw Material Consumption lbs. per lb.*		
		1950	1955	1958
Benzyl acetate	Benzyl chloride	1·37	1·26	1·28
Heliotropine	Sassafras oil	3·3	2·1	2·06
Hydrooxycitronellal	Coriander oil	12·5	7·5	7·1
Ionone	Coriander oil	4·1	3·8	3·7
Jasmone	Castor oil	9·9	6·0	5·6

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Most of this article is based on I. M. Torbin, *Ekonomika Khimicheskoy Promyshlennost*, 1960, No. 4, p. 443. Additional information is taken from recent issues of the Russian perfumery trade journal *Maslo-boino-zhirovaya promyshlennost* and on V. N. Byelov *et al.*, "Uspekhil Khimii Dushistikh Veshchestv" (1956).

MILLS AND SIEVES (*Continued from page* 156)

In addition to this gyratory motion the sieves are given a vertical oscillation 300 times a minute, effectively breaking up any aggregates of powder.

The Griffin and George vibratory ball mill can be converted to a sieving machine by fitting an attachment into the cradle that normally holds the pot. The sieves are then subjected to vigorous vibration in this machine and separation of material takes place very quickly, but owing to the rapid movement some size reduction can take place, especially with friable materials.

In order to increase the rate of flow of material through very fine sieves and to eliminate the problem of clogging, the Alpine Air Jet Sieve (Fig. 7) has been devised. This apparatus employs pneumatic blowing as well as suction in order to fluidise the material.[8]

The powder is placed on a sieve the top of which is closed by a transparent cover. Sieve and cover are fitted into a housing and air is sucked out of the space beneath the sieve by a pump. Incoming air passes up through the sieve by means of a slotted nozzle which rotates immediately beneath the sieve. The inlet air keeps the bed fluidised and material which is finer than the sieve is drawn through the meshes of the sieve by the suction pump and can be collected, if required, on a filter. A few minutes is all that is necessary to separate a size range in this way and a further "cut" can be removed by replacing the sieve with a coarser mesh. It is possible, using this machine, to separate a particle size down to 20 or 30 microns even with powders which under other conditions of sieving would agglomerate and block up the meshes.

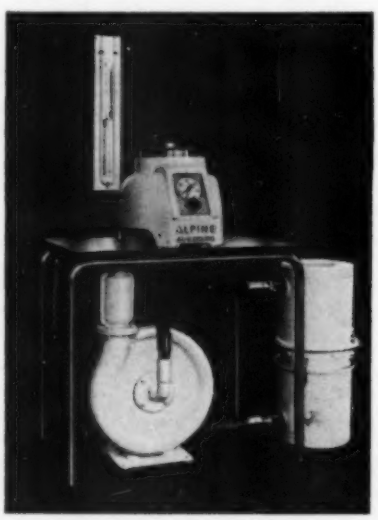

Fig. 7. Alpine Air Jet sieve for very fine materials (Lavino Ltd.).

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Correction. In the first article of this series, "Emulsifiers" (page 101 March, 1961), captions for Figs. 6 and 14 should be interchanged.

3. Fermentation Processes

By Greville Machell, B.SC., PH.D.

Dr. Machell concludes his series on carbohydrates by describing some of the many fermentation processes in which they are used, including the production of penicillin and streptomycin, dextran, ethanol, butanol, acetone, citric acid, lactic acid and itaconic acid. The first two articles covered simpler carbohydrates (December), and cellulose and its derivatives (February).

A LARGE tonnage of carbohydrate material is used annually in the fermentation industries to produce a considerable range of products. Generally the production of pure organic chemicals by fermentation processes is giving way to synthetic processes, but this trend has by no means reached completion. It is impossible to give complete coverage of the subject in a short article, but numerous detailed accounts are already available,[18] and discussion will therefore be limited to a brief description of the main products.

The two main carbohydrate raw materials for fermentation are starch and sucrose. Many micro-organisms are unable to use starch directly, and a hydrolysis to glucose is often a preliminary step of the fermentation process.

Pure sucrose is not often used owing to its relatively high cost, molasses being a cheap and generally acceptable alternative. Molasses contains glucose, fructose and other carbohydrates as well as sucrose, but as sucrose is broken down to glucose and fructose during the fermentation, this is no drawback. A raw material of lesser importance is lactose from milk, although the supply tends to be uncertain due to fluctuations in milk production.

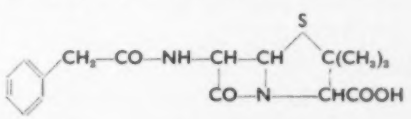
Acetone and butanol

The fermentation of diluted molasses or cornstarch with micro-organisms of the *Clostridium* groups affords a mixture of butanol, acetone and ethyl alcohol in the approximate proportions 4 : 2 : 1, as well as a large amount of carbon dioxide and hydrogen. The three liquid products are separated from each other and the large amount of water present by a series of fractional distillations. Disadvantages of this process are the necessarily large volumes to be handled and the relatively low yield (30%) of useful products from the carbohydrate consumed. The process is also particularly liable to contamination and absolute cleanliness is vital. Competition from synthetic procedures has now, in the United Kingdom, rendered this fermentation process obsolete, but it is still operated elsewhere. Acetone is of course available from *iso*propanol and more recently as a co-product in the oxidation of cumene to phenol, while butanol is produced from acetaldehyde, propane and butane. Were it not for the fact that riboflavin and other valuable components of the vitamin B complex are present in the fermentation residues, production of acetone and butanol by fermentation would possibly have ceased altogether.

Acetone is a valuable solvent, and is now being used in increasing amounts as an organic chemical intermediate, for instance in the manufacture of methyl *iso*butyl ketone, methyl methacrylate and bisphenol-A (for epoxy resins). Butanol is used as a lacquer solvent, and in the manufacture of a number of esters, such as butyl acetate, which are used as solvents and plasticisers.

Antibiotics

The basic fermentation medium used in the manufacture of antibiotics such as penicillin and streptomycin utilises carbohydrates as the source of carbon. Carbohydrate-containing by-products such as molasses and corn-steep liquor are fortified by the addition of lactose. Other constituents include small amounts of nutrient salts and various organic chemicals; the latter increase the yield and in the case of penicillin modify the type of penicillin produced. Thus addition of phenylacetic acid aids the production of penicillin G, which contains a phenylacetyl group in its molecule as shown in XXIV.



(XXIV)

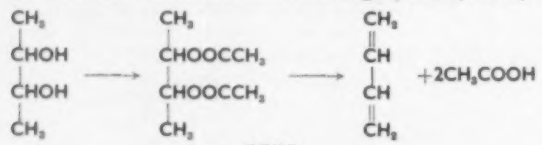
In addition to the medical and veterinary uses of antibiotics, applications as growth stimulants in animal feeds and as inhibitors of moulds and bacteria are developing.

2 : 3-Butylene glycol

The fermentation of molasses and other agricultural by-products of a carbohydrate nature with *Aerobacter aerogenes* produces a complex mixture of products. However, under carefully controlled conditions the main product is 2 : 3-butylene glycol (butane-2 : 3-diol),

accompanied by smaller amounts of ethyl alcohol, lactic acid and acetoin, $CH_3CHOHCOCH_3$. The yield of the desired product may be as high as 80% based on the amount of fermentable carbohydrate in the starting material.[19] Isolation of the product from the fermentation liquors presents considerable difficulties. Vapour phase extraction with superheated steam gives high recoveries, while solvent extraction also appears to be feasible.

There was great interest in the manufacture of 2 : 3-butylene glycol during the late war and a number of commercial processes were evolved. The interest lay in the acetylation of the glycol and subsequent pyrolysis of the di-acetate to 1 : 3-butadiene in high yield. (XXV)



(XXV)

Butadiene was of course required for the production of synthetic rubber, but this demand can be met at present more than adequately by the petroleum chemicals industry. The hygroscopicity and low vapour pressure of 2 : 3-butylene glycol suggest uses in adhesives, paper and textiles, but in general other compounds such as glycerol are preferred.

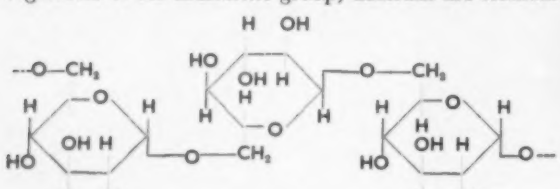
Citric acid

At one time citric acid was extracted from the juice of citrus fruits and pineapples, but is now produced almost exclusively by fermentation. The fermentation of diluted molasses with *Aspergillus niger* at about 25°C. over some 10 days in the presence of air gives up to an 80% yield of citric acid based on the carbohydrate fermented. Two main variations of the process employ shallow trays and deep fermentation respectively, current trends being in favour of the latter process. Oxalic and gluconic acid are also formed, the former being recovered by preferential precipitation of the insoluble calcium salt. Subsequently, the citric acid is also isolated as the calcium salt, from which the free acid is obtained by the addition of the calculated amount of sulphuric acid.

Most of the citric acid produced finds its way into foods, drinks and pharmaceuticals, but there is also a small demand for certain esters of citric acid as plasticisers. Citric acid is also a selective sequestering agent for iron, but its commercial use for this purpose has not developed as once expected.

Dextran

Polysaccharides have also been synthesised with the aid of micro-organisms, an example of this being the production of dextran. When substances containing sucrose, such as molasses, are incubated with micro-organisms of the *Leuconostoc* group, dextrans are formed.



(XXVI)

These polysaccharides are built up from glucose only, the main mode of linkage being shown in XXVI, although the molecule is branched.

Dextrans achieved prominence during the recent war, and are now well established as blood plasma substitutes. At the same time dextran sulphate is being used as a blood coagulant.

Ethanol

The fermentation of carbohydrates to produce ethanol (ethyl alcohol) is well known and will only be described in outline. Molasses is one of the most popular raw materials for ethanol production, but various cereal starches and potatoes are also used. Starches must first be hydrolysed to glucose either by mineral acids or by using the enzymes obtained, for example, by the controlled germination of barley.

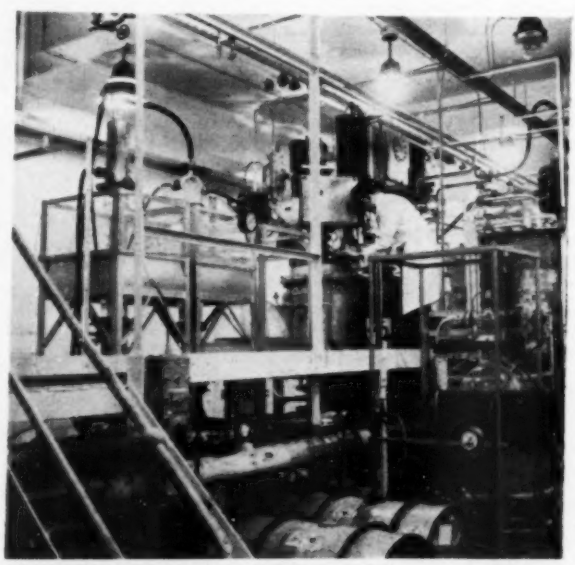
To the dilute solution of sucrose or glucose is added yeast, which contains the two enzymes invertase and zymase; the former converts sucrose to a mixture of glucose and fructose, while the latter further transforms these two carbohydrates to ethanol and carbon dioxide. Fractional distillation of the liquid product gives an azeotropic mixture of ethanol and water (containing 95% ethanol) in about 90% yield (XXVII)

$$C_6H_{12}O_6 \longrightarrow 2C_2H_5OH + 2CO_2$$

(XXVII)

The large amount of carbon dioxide and the small quantity of amyl alcohol also produced are both recovered. The 95% ethanol may be sold as such, or the 5% water removed either by azeotropic distillation with benzene or counter-current washing with glycerol or ethylene glycol.

Waste liquors from the sulphite process of wood cellulose production contain carbohydrates. The fermentable portion of the latter amounts to about 1·5% by weight of the waste liquor, and ethanol is produced from these liquors with the aid of yeast using a continuous process.



"Intradex" operations being carried out at Glaxo's antibiotics plant, Barnard Castle. Improvements to unit operations involved in the production of clinical dextrans and their derivatives are studied in this pilot plant.

An operator seeding a fermentation vessel in the production of industrial alcohol at a Distillers Co. plant.

In recent years production of ethanol by fermentation has met severe competition from synthetic processes, which are based on cheap ethylene gas. The main uses of ethanol are as a solvent, in the manufacture of acetaldehyde by oxidation, and in the production of esters such as ethyl acetate.

Gluconic acid

A relatively recent development in the fermentation field has been the production of gluconic acid; the preparation of this acid by the chemical oxidation of glucose has already been noted in an earlier section. Fermentation of sucrose or glucose containing materials in the presence of air with a wide range of moulds and bacteria produces glucono-lactone, which is hydrolysed to gluconic acid spontaneously. Numerous uses for gluconic acid and its salts have already developed, a number of them in foods and drugs where its non-toxicity recommends it. Ferrous and calcium gluconates are used as sources of iron and calcium in medicine and the latter in animal feeding stuffs. Gluconic acid is a valuable sequestering agent, being only slightly inferior to saccharic acid (mentioned earlier) in this respect.

Glycerol

During the first and second world wars the shortage of glycerol became so acute that efforts were made to produce it by a fermentation process. It has long been known that in the fermentation of carbohydrates by yeasts, traces of glycerol are formed as well as the desired ethyl alcohol. By the addition of a bisulphite or an alkali to the fermentation medium, the yield of glycerol is increased enormously although much alcohol is still obtained. The overall equation for the fermentation of carbohydrates to ethyl alcohol has been given earlier; in the presence of bisulphite or alkali, part of the carbohydrate is fermented as in XXVIII.

$$C_6H_{12}O_6 + NaHSO_3 \longrightarrow CH_2OH.CHOH.CH_2OH + CH_3CHO.NaHSO_3 + CO_2$$

$$2C_6H_{12}O_6 + NaOH \longrightarrow 2CH_2OH.CHOH.CH_2OH + C_2H_5OH + CH_3COONa + 2CO_2$$

(XXVIII)

These processes have been worked commercially in times of glycerol shortage, and a large chemical combine in the United Kingdom intended to use the process in the early nineteen fifties. However this idea was shelved when two synthetic processes were evolved for the manufacture of glycerol from propylene; one of these processes has already been mentioned in connection with glyceraldehyde. Glycerol is used as a humectant and softening agent. The trinitrate (" nitroglycerine ") is used as an explosive, and polyesters with dicarboxylic acids are the well-known alkyd resins.

Itaconic acid

Itaconic acid, otherwise known as methylenesuccinic acid, is an unsaturated dicarboxylic acid, and as such has obviously considerable commercial potentialities. Until recent years, however, it was only available on a small scale, being prepared by heating citric acid until it melted, and then refluxing the product, itaconic anhydride, with water.

The yield of itaconic acid was low—less than 50%—and the purification difficult due to the synchronous formation of other products, including the isomer, citraconic acid.

However, this situation was changed by the discovery that the fermentation of a 6% solution of glucose with *Aspergillus terreus* produces itaconic acid in over 80% yield, the product being readily isolated from the medium by concentration and crystallisation.[20] This process is now in commercial use, and itaconic acid has already found numerous applications. The acid and its esters can be polymerised, and also form copolymers with other monomers such as methyl methacrylate. The patent literature contains a large number of claims for polymerised itaconic acid derivatives in adhesives, plastics, acrylic fibres, elastomers and surface coatings, and now that the acid is available cheaply in larger quantities, commercial developments will no doubt follow along these lines.

Lactic acid

The production of lactic acid was reviewed in this journal recently[21] and, like citric acid, this acid is produced by fermentation. In the United Kingdom, hydrolysed starch is the raw material and *Lactobacillus delbruckii* is the bacterium employed. The yield of lactic acid is usually greater than 90% in a fermentation occupying about six days.

Lactic acid is used in foods and beverages, in tanning and in laundry work, while salts are used in animal feeding stuffs and esters as plasticisers.

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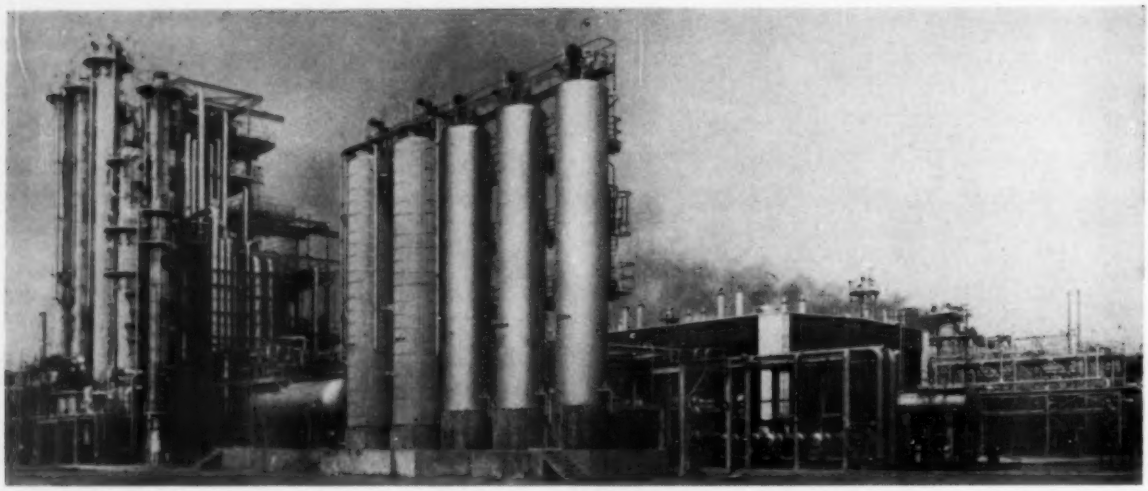


Grangemouth, one of the earliest petrochemical complexes to spring up in this country. This is a typical example of an integrated scheme of chemical production which makes the most economical use of common services and raw materials. This is a view from the south-east of the No. 3 ethylene plant at the British Hydrocarbon Chemicals Ltd. installation in this complex.

Chemicals—An Industry of Elephants

The Big Companies Get Bigger But There Are Still Opportunities for Small Firms

*Takeovers in the chemical industry have increased in number, particularly in the past year or so, but they are not a new feature of the chemical scene. They have been going on for over 40 years and are likely to continue because now, more than ever, success demands very large-scale organisation. Competition is tending to move from that between companies to that between national chemical industries. Dr. James Taylor, a director of I.C.I., made these points in his recent lectures at the Royal Society of Arts. They are summarised in the following article which also draws upon a recent paper by C. J. Thomas.**

FOR a number of reasons chemical companies are becoming more international. Economic nationalism which has intensified in recent years has resulted in chemical plants being erected in many countries by foreign capital, and there is also a movement, not particularly strong to date but growing in impetus, to manufacture chemicals where the raw materials of manufacture are advantageously available. For example, some petrochemical plants are located at selected sites where olefine gas streams are cheaply available.

Only large companies can support world-wide manufacturing and selling organisations and the growth of international activities thus tends to favour the large company.

The recent formation of the European Economic Community must also have a profound effect on the chemical industry. Many companies are now considering possible manufacture in E.E.C. in order, as Lord Fleck remarked "to serve a compact highly industrialised market with relatively high purchasing power and consisting of some 250 million people . . . a market comparable to that of the largest, richest and most sophisticated buying public in the world—the United States domestic market."

As a result the chemical industry is likely to become more international in character than it has been hitherto, and be organised into larger concerns.

In Britain the provisions of the Restrictive Practices Act may tend to drive inefficient firms out of business and promote the aggregation of small units into larger ones which can be reasonably self-sufficient and possess adequate resources.

Monopolies

Many factors operate to produce monopolies (by statutory definition an organisation which commands 33⅓% or more of the trade). This tendency is likely to continue and perhaps intensify.

I do not believe that monopolies, as such, are objectionable. Nor does the law presume that monopolies are bad; it provides machinery for enquiring into possible abuse of monopoly power, but only if, after prolonged and careful investigation,

* Lecturer in Economic Statistics at Southampton University. Published in the *Journal* of the Royal Institute of Chemistry, January 1961.

such abuse is shown to exist does the question of remedial action arise.

Reddaway in relation to the British chemical industry wrote recently "one of the advantages of having production largely in the hands of a few very big firms is that they assume a sense of responsibility to the public interest which is probably more valuable than any formal regulations or agreements could be in such a complex and changing industry. Moreover, there are a number of checks and balances in the industry which make unduly restrictive practices hard to maintain."

It is too often assumed that unbridled competition promotes healthy industry and is essentially good. What in fact often happens where such conditions operate is that profits are insufficient to allow for re-equipment and innovation in the industry, and there is no margin for research and development activities which are so essential if industry is to make any progress and meet outside competition.

It is clearly inefficient and wasteful from the national point of view to have a number of similar firms duplicating research, development and sales organisations and erecting at great cost similar plants, often not fully occupied, and cutting one another's throats even in the export trade.

Competition is essential for progress and efficiency, but it is nonsense to suppose that inefficiency arises from monopoly *per se*. Indeed, a monopoly position may develop because of a firm's efficiency and not because it has consciously sought that position. Since competition stems from the urge to survive it will arise if not in one form, then in another. In the chemical industry, for example, international competition is becoming increasingly severe and British industry will only be fit to meet it with large efficient organisations. There are, of course, the seeds of retrogression and decay in any large organisation, but they exist too in smaller organisations. It is not only the elephant which grows old and dies. Many smaller animals have much shorter life cycles.

Capital investment and expenditure

Capital expenditure in the chemical industry since 1949 is shown in Table 1. The annual rate of capital expenditure has risen from about £64 million in 1949 (corrected to 1959 prices) to £163 million in 1958. There was a temporary setback in 1959 due to credit restrictions, but the position appears to have recovered. The current figure equals about 17% of the total expenditure in all manufacturing industries. Total capital invested in fixed assets in the chemical industry is reliably reported to be in excess of £2,000 million.

Table 1. Gross Fixed Capital Formation at 1959 Prices

	£ m.
1949	64
1950	84
1951	100
1952	99
1953	110
1954	114
1955	117
1956	151
1957	158
1958	163
1959	126

Research expenditure

Necessarily, there is a large expenditure on research, and the distinctly chemical core of the whole group of chemical industries in 1958 spent £22 million, which was equal to 10% of the total sum expended for all manufacturing industry. The whole group itself spent £43 million on research, which works out at £6,500 per qualified worker. In mineral oil refining this figure was nearly £10,000.

Because of these high costs it is only large firms that can undertake research on a large scale and they generally do so because they benefit by much more than the cost. The rate at which firms grow in the industry is naturally influenced by the amount of research they carry out.

The research effort is unevenly distributed throughout the various sections of the chemical group; half the research effort, £22 million or so, is in the chemical core as stated, a sixth (£7 million) is in mineral oil refining, and an eighth in the pharmaceutical industry. I.C.I. accounts for more than half the research expenditure in the chemicals (general) group; in 1959, for example, research and development expenditure (including technical services) was £14 million. The Distillers Co. and Monsanto also carry out research on an appreciable scale, and the latter can benefit from the work carried out by the parent company in the United States.

Process economies

Chemical processes, to a greater degree than most other production processes, become more economical when operated on a large scale. This is because the substances involved are amenable to handling in simple vessels—an increase in production needs only an increase in the capacity of pipes and vessels. For purely geometrical reasons larger plants are more economical to operate, the capital cost of chemical plants increasing much more slowly than the output. It has been estimated that the capital cost per unit of output falls to a quarter for a tenfold increase in capacity.

This remarkable drop in capital cost is a feature of continuous-process plants where all items are in constant use; the batch principle offers less scope for economies because apparatus is only intermittently employed.

Costs of operation also fall as output is increased. Besides power and fuel savings, there are also savings in manpower, especially where continuous plant is in operation with little handling of materials and usually much instrumentation and control equipment.

As well as these economies derived from enlarging individual chemical plant, there are others, external to the plant itself, that arise from the communal provision of services such as steam, electricity and compressed air to a number of separate but adjacent production units. An example of a large integrated chemical works taking advantage of these economies is the new Wilton works of I.C.I. It is proposed to develop the Severnside site along the same lines.

Of special interest are the new large high-pressure catalytic reforming plants and Lurgi plants of the Gas Board for producing fuel gases. The Lurgi plant uses oxygen instead of air to oxidise the coal or fuel—this has been made possible by the introduction of tonnage oxygen plants. Techniques of preparing oxygen cheaply in bulk have made possible several important advances in industrial chemistry and metallurgy.

Petroleum chemicals

The most important field for advancement appears to be in petrochemicals. There are 27 pro-

jects directly concerned with petrochemicals and these account for a high proportion of the expenditure. In addition to these there are 31 projects concerned with polymeric materials. The chemical industry is successfully keeping up with the increasing demand for heavy chemicals and fertilisers, and in addition is exploiting new techniques.

Table 2. The Larger United Kingdom Chemical Companies

Company	*Order of Size 1959 Trading Profit Basis*	*Actual Trading Profit —1959 £000's*	*Product Groups*
I.C.I.	1	121,257	Organic and inorganic chemicals, dyestuffs, pharmaceuticals, fertilisers, explosives
Distillers	2	27,100	Fine chemicals, P.C. products,* distillation products
British Oxygen Co. ..	3	14,329	Welding and industrial gases
Boots Pure Drug Co. ..	4	8,009	Heavy chemicals, pharmaceuticals, medicinals, P.C. products*
Albright & Wilson ..	5	6,940	Heavy chemicals, fats and greases, P.C. products*
Glaxo	6	6,582	Pharmaceuticals
Borax (Holdings) ..	7	5,569	Heavy chemicals, rare earths
Fisons	8	5,312	Sulphuric acid, fertilisers
Monsanto	9	4,525	Plastics, acids, pharmaceuticals
Laporte	10	2,860	Heavy chemicals, soap powders, detergents, borium compounds
De La Rue	11	1,945	Plastics
W. J. Bush	12	1,030	Aromatics, dyestuffs, intermediates
British Glues & Chemicals	13	822	Glues and greases, fertilisers, animal foods
F. W. Berk & Co. ..	14	750	Heavy chemicals, medicinals, pharmaceuticals
Reichhold	15	723	Synthetic resins and resin compounds
Hickson & Welch ..	16	702	Dyestuffs and intermediates, P.C. products*
Boake Roberts & Co. (Holdings)	17	387	Heavy chemicals, pharmaceuticals, plasticisers, fats and greases
Wm. Blythe & Co. ..	18	374	Heavy chemicals, medicinals, pharmaceuticals
L. B. Holliday ..	19	341	Dyestuffs
Hardman & Holden	20	309	Heavy chemicals, fats, greases
Lawes Chemical Co. ..	21	141	Chemical fertilisers
Howard & Sons† (1958)	22	135	Organic chemicals, plasticisers

Source—Moodies Sheets.
* Pest Control Products.
† Data for 1959 not available.

Future chemical trends

Statistics indicate that by 1970 the total production of synthetic fibres may be 420,000 tons, which is nearly double that of today. Resins and plastic materials may well be around 1¼ million tons compared with the ¾ million tons at present.

Total production of organic chemicals is likely to increase about 2¼ times over the next ten years and inorganic chemicals by about 40%.

Polypropylene may well play a large part in the expansion, both as a film and as a fibre forming material. The production of foamed plastics and synthetic rubbers is likely to increase very substantially. Synthetic detergents will also be required in much larger quantities.

Newer metals and materials of a purity previously unparalleled for specialist applications will be in great demand. Important advances in colour photography have been made recently and this business is certain to increase. Rocket fuels may also become substantial business.

Trends in synthetic materials are very much in the hands of the public. Synthetics were originally designed to imitate natural products and were regarded as ersatz or poor substitutes. Now the position is slowly changing and many people realise that synthetics often have properties which are clearly superior to those of natural products. As the public comes to appreciate synthetics in their own right—not as substitutes—there will be a great increase in the demand for higher polymeric substances.

In the fermentation industries, especially the newer ones producing penicillin, streptomycin and so on, for lack of alternative synthetic routes the chemist is using microbiochemical methods of preparation, but he is applying to the separation and analysis of the products chemical techniques of the highest order.

A completely new field for chemical manufacture is that of nuclear energy. All present trends indicate that this industry will become a major one. A time will come when the preparation of nuclear fuels and elements may form a great chemical industry with considerable demand for new metals, for new materials of construction, and for ultra-pure elements and compounds.

As quantitative chemistry extends, so the chemical industry will expand to obtain new qualities and effects in materials to fulfil current and future demands. In addition, new uses, probably quite novel and unforeseen, will be established for modified materials. This will result in further diversification of the industry.

Employment of manpower

As the industry expands, naturally the demand for manpower increases, although the increase is no indication of the progress of expansion since more and more mechanised plants, employing fewer people, are being built. There were about 400,000 people engaged in the chemical and allied industries in 1957; this is nearly double the number employed in 1937. At the present time over 11,000 of these are scientists and technicians.

A place for small firms

The chemical and allied industries are heterogeneous, and although many of their activities require large resources there is still room for the small efficient specialist. According to the 1954 census of production, of 3,255 firms employing in total 338,000 people, there were 1,424 with less than 11 employees, 1,773 with between 11 and 1,000 employees, and 58 with more than a thousand. The large firms account for about 38% of the gross output, of the net output and of the employment.

Size of companies

Table 2 lists the larger U.K. chemical companies and their main products. The companies are given in order of size as judged by the trading profits (1959). The list excludes the oil companies because their activities are only partly concerned with chemicals and are not readily separable.

In order to compare the United Kingdom with other countries, Table 3 gives the larger companies in the western world. It will be seen that I.C.I. is the only British company on the list of 38. (Other British companies should also be included on this list, *e.g.* Distillers, British Oxygen, Boots, and Albright and Wilson.)

Inter-firm relationships become extremely important when the number of intermediate products and feedstocks flowing between different firms is as great as it is in this industry. Although I.C.I. produces 40% of the industry's output, sometimes being in the position of sole producer of certain chemicals, it produces less than 10% of the 8,000 or so chemicals produced by the chemicals (general) industry. I.C.I. itself is also a large purchaser of the 7,000 or so chemicals which it does not produce but which it uses in the production of other chemicals. The other large firms are more specialised than I.C.I. and tend to confine their activities to a smaller number of broad sectors. Distillers and Monsanto are leading producers in three of the seven main sectors of the chemical group. Fisons has an interest in three sectors, while other firms generally are exclusively interested in one broad sector.

Table 3. The Larger American and European Chemical Companies

Company	*Order of Size 1959* Sales Basis	Employees Basis	*Sales 1959* $ millions	*Employees 1959* 000's
Du Pont (U.S.A.)	1	2	2,114	85
Union Carbide (U.S.A.)	2	4	1,531	59
Imperial Chemical Industries (U.K.)	3	1	1,424	110
Borden Co. (U.S.A.)	4	10	941	32
Allied Chemical Co. (U.S.A.)	5	11	720	30
Dow Chemical Co. (U.S.A.)	6	13	705	27
Olin Mathieson (U.S.A.)	7	9	702	38
Monsanto Chemical Co. (U.S.A.)	8	18	615	19
Farbenfabriken Bayer (Germany)	9	5	585	55
American Cyanamid (U.S.A.)	10	12	584	29
B.A.S.F. (Germany)	11	6	540	53
Farbwerke Hoechst (Germany)	12	7	529	45
Montecatini (Italy)	13	3	472	60
W. R. Grace (U.S.A.)	14	8	470	41
Kaiser Aluminium & Chemical Co. (U.S.A.)	15	16	436	20
Saint-Gobain (France)	16	17	395	20
Rhone-Poulenc (France)	17	20	304	15
Pechiney (France)	18	14	298	25
Hercules Powder Co. (U.S.A.)	19	23	284	11
CIBA (Switzerland)	20	15	235	21
Stauffer Chemical Co. (U.S.A.)	21	27	228	7
E. Merck (U.S.A.)	22	21	217	12
Rohm & Haas (U.S.A.)	23	19	216	17
Chemstrand Corporation (U.S.A.)	24	25	197	9
Glidden (U.S.A.)	25	28	196	6
Parke Davis (U.S.A.)	26	22	192	11
Thiokol Chemical Co. (U.S.A.)	27	24	190	10
Hooker Chemical Corporation (U.S.A.)	28	33	150	5
Diamond Alkali Co. (U.S.A.)	29	30	138	5
Abbott Laboratories (U.S.A.)	30	26	123	9
Interchemical Company (U.S.A.)	31	32	123	5
Vick Chemical Company (U.S.A.)	32	31	115	5
Wyandotte Chemicals (U.S.A.)	33	34	94	4
Reichhold Chemicals (U.S.A.)	34	38	94	2
American Agricultural Chemicals (U.S.A.)	35	35	91	4
Pennsalt Chemicals (U.S.A.)	36	36	88	3
Schering Inc. (U.S.A.)	37	29	81	6
Miles Laboratories (U.S.A.)	38	37	72	3

Source—The *Fortune Directory* of the 500 largest U.S. Industrial Corporations, and the 100 largest Foreign Industrial Corporations.

Plans for expansion

A survey published last year gives an idea of development in the next few years. Total capital expenditure sanctioned, completed or put in hand during 1960 amounted to nearly £200 million. The actual total is now probably £220 million or more. The survey includes 106 firms and covers a wide range of undertakings both in size and type.

In the inorganic field, requirements for sulphuric acid have at last caught up with the surplus capacity and there are at least eight projects in hand. A part of this expenditure relates directly to the fertiliser industry. There are two increases for chlorine and caustic soda which appear to cover the normal rise in demand. There are also six projects for manufacturing fertilisers, reflecting the growing demand for compound and concentrated fertilisers.

SWEETENERS

For the first time a book has been published which deals both with sweeteners made from corn (maize) and those derived from cane. "Sweeteners for Industry" is a new publication produced by the refinery group of Brown and Polson Ltd. (with which George Clark and Son Ltd. is associated). It describes selected grades from a range of sweeteners which is as comprehensive as any produced by a single group of companies anywhere. The information in the book is set out in eight sections, each fitted with tabs and containing cross-references so that any fact or figure is quickly found. Under the heading "Corn and Cane Sweeteners" the range of products is discussed, which includes liquid glucose, solid and powdered glucose, brewing sugars, liquid sugar and mixtures, inverts, syrups and caramel. How these products are made is described in a section where the complete manufacture and quality control checks used are summarised in fold-out, coloured flow-charts. Each industry that uses sweeteners is discussed, the types of products they can utilise and the recommended grades are given. Technical information contained in two sections gives the data that are needed every day when using sweeteners, and analytical methods that cannot be found easily in standard reference books.

Pumps for Chemical Duties

By A. Flindle, M.I.MECH.E.

It is now accepted that pumps have to be specially designed for chemical duties—it is not enough simply to adapt a water pump and build it in chemical-resistant materials. In the past two or three years a number of improved chemical pumps have been introduced. Their characteristics and performance are reviewed in this article.

THERE is an ever - increasing demand for pumps for all kinds of duties. Thus the pump designer is constantly faced with new problems because of increasing pressures and temperatures and the extended use of volatile, corrosive and viscous liquids in chemical undertakings and refineries.

Apart from a sound knowledge of hydraulics, the designer must be fully aware of modern metallurgical research in his choice of materials.

There has always been a large number of manufacturers supplying water pumps to industry, but until recently the ranges of chemical pumps were limited to those which were constructed of special materials such as ebonite, stoneware and plastics. Indeed, until only a few years ago a pump made of materials other than cast iron or bronze was considered a " special " pump. Although most textbooks dealing with pumps do not discuss the design of pumps for the chemical industry, it is wrong to assume that a design developed for pumping water can be adapted for pumping corrosive chemicals simply by using different materials of construction.

The following are the main criteria used when selecting a pump for the chemical and process industries:

1. simplicity of design
2. suitable materials of construction
3. minimum of leakage points
4. capability of dealing with vapour and solid entrained in the liquid.

The first criterion is necessary for economy; if a maximum number of parts are interchangeable this will reduce stocking of spares and make all parts easily accessible.

Corrosion

Corrosion problems in pumps are often of a complex nature. Thus the liquid pumped as well as the concentration of oxidising agents such as air and steam must be taken into account. A primary factor controlling corrosion is the tendency of the metals to dissolve electrolytically in the solution pumped. For this reason homogeneity of the surface is of great importance, *i.e.* cracks, scratches and rough machining parts should be avoided. The ability of some metals to generate a self-protecting film is therefore of great value. Very useful guides are both the *p*H and galvanic scales which give a first indication of metals not to be used. Only metals which lie close to one another on the galvanic scale may be used safely and dissimilar metals should, if possible, be insulated and the less noble metal be suitably coated. Aeration of the liquid should be prevented, or at least limited, and the hydraulic phenomena of cavitation entirely avoided.

Plenty and Son Ltd., manufacturers of positive displacement rotary variable capacity pumps, supply four sizes of stainless steel " Easiclean " pumps—1 in., 1¼ in., 2 in., and 3 in.—all fitted with dairy connections. The three smaller sizes are " Universal " (variable flow), and the 3 in. is a " General " (fixed flow) type. Capacities of the pumps range from 0-60 to 4,500 g.p.h. and discharge pressures up to 75 p.s.i. All are self-priming.

The photograph shows a portable AB " Universal " pumping set at an English chemical factory metering dermatological cream.

Leakage

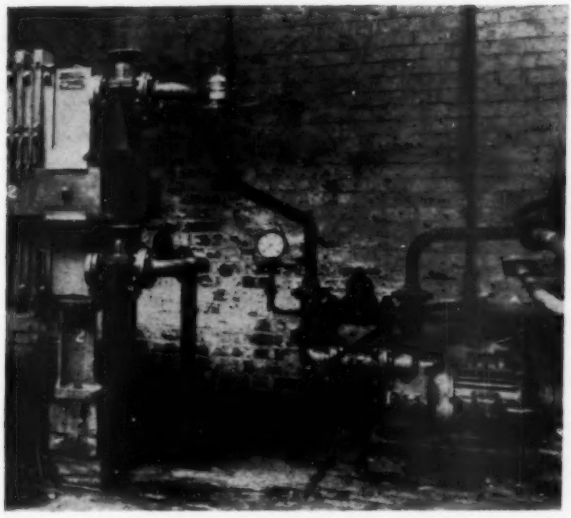
To minimise maintenance of joints the wetted casing should be reduced to be simple and circular. It is difficult to seal around the rotating and reciprocating shaft. Recently increasing attention has been paid to this point and many special designs of chemical pumps have been evolved to improve or eliminate the shaft seal.

Glandless pump

Attempts to avoid both stuffing boxes and mechanical seals have led to the development of the glandless pump which can be either horizontal or vertical. The advantage of this pump is that it has no stuffing box or mechanical seals, but some other device to minimise leakage, such as diaphragms. One manufacturer redesigned the pump diaphragm of his glandless pump and now claims five times the life without any increase in cost. Experiments are still proceeding with *Viton* valves and diaphragms; these would enable the pump to be widely used in the chemical industry, especially where highly corrosive and abrasive liquids have to be pumped.

Double volute pumps

Many pumps used in chemical works have to operate continuously and have to be designed so that overhaul is as simple as possible. For these reasons there is an increasing tendency to use double volute single-stage pumps, and experience has shown that any additional cost for these units as compared with the straightforward conventional volute pump is amply repaid in working life—especially in those cases where



The new filtration pump developed by Mono Pumps Ltd. is lined with ebonite and has Langalloy and Corronel rotating parts. It will deliver to a filter press at a maximum pressure of 40 p.s.i.

long hours of service are demanded and the working pressure is relatively high. The double volute is introduced for the purpose of eliminating the unbalanced radial pressure forces which are known to exist in the conventional volute pump. These forces vary in intensity and they are more evident when the pumps are called upon to operate under conditions that are not conducive to best efficiency.

Another feature tending to popularise the double volute pump is the particular benefit obtained in those instances where mechanical seals are required in preference to soft packed stuffing boxes, because while the turns of soft packing play a supporting rôle as a steady bearing in the straightforward volute pump, a similar performance from mechanical seals cannot be expected. The effect of unbalanced radial forces becomes rather more pronounced and irritating when high capacity or high head continuous service pumps are in use.

Diffuser pumps

Modern trends in pumping practice are to standardise where possible on one pump size and achieve from it maximum head/quantity variation, so that users may install an absolute minimum number of sizes of pump. In these cases the introduction of a diffuser instead of the double volute not only compensates for unbalanced forces but also gives maximum efficiencies over a fairly wide selection of different impellers used in the same basic casing.

In this case any extra additional cost is more than offset through the advantage gained by flexibility of duty selection and small quantity of spares to be carried. Thus "in line" vertical diffuser pumps have the suction and discharge branches arranged so that the pump actually fits into the pipeline as simply as an ordinary pipe section. Their driving motors are arranged immediately above them and the impeller is mounted upon the motor shaft extension so that the initial cost is considerably reduced by the elimination of baseplate and coupling; there is also appreciable saving in floor space.

The Sigmund "in line" pump can be easily dismantled and taken to a bench for cleaning and inspection and/or fitted with a different impeller for different duties. The range of these "in line" pumps is very large; for one size supplied with impeller/diffuser combinations, capacities up to 400 U.S. gal./min. and heads up to 350 ft. can be attained.

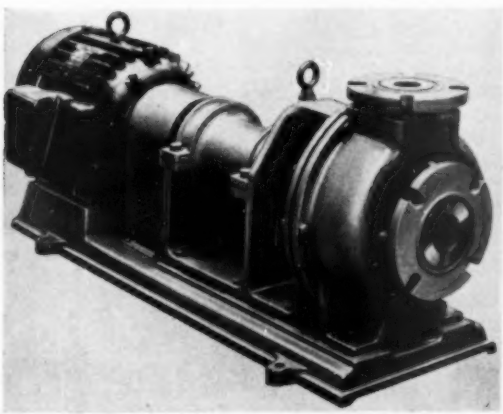
Another form of "in line" pump which can be interposed in a pipeline exactly like a sluice valve has been developed by Mather and Platt. It is particularly suited to a.c. motor drives at low, medium, or high speeds at all frequencies up to 60 cycles. It can be used for general water service or for handling corrosive liquids, water containing chemical impurities, chemical liquors of many kinds and liquids at high temperature; no couplings are required as the motor and pump unit have a common shaft.

Pumping corrosive liquids

For handling corrosive and highly volatile liquids it is necessary to have a self-priming pump. A recently introduced pump works on the recirculation principle, the main advantage being that all the liquid is held below the centre line of the pump and it is therefore unnecessary to have a non-return valve and check flap fitted into the suction side of the pump. The pump has been successfully employed for many applications, as for example in the handling of ether, with a suction lift of 10 to 12 ft. and in the extraction of sludge from the bottom of a still under self-priming conditions.

These pumps, manufactured in a wide range of materials of construction, are at present available for capacities of 630 to 1,550 gal./min. against a total head from all causes of 5 ft. Heads up to 90 ft. are also possible at reduced capacities down to 200 gal./min.

An end suction 2 in./2½ in. centrifugal pump made from silicon iron castings has been designed by Lee Howl and Co. for handling corrosive liquids, *i.e.* sulphuric acid at any temperature or concentration, nitric



A Mitchell Craig centrifugal acid pump. The pump suction and delivery pipework is accommodated on the main pump body. The complete impeller and bearing assembly can be withdrawn for maintenance without breaking the main suction and delivery connections. The pump can be supplied with either a standard type of packed gland or mechanical seal. Standard fittings include open type impellers so that clear liquors or medium/heavy slurries can be pumped.

The Centri-Compact pump made by Midland Dairy Machines Ltd. is claimed to be outstanding for ease of cleaning and inspection of all surfaces in liquid contact.

acid, acetic, formic, phosphoric acid and many others. No wear rings are fitted, the impeller running clearance being generous, thereby avoiding rapid loss in pumping efficiency from wear and corrosion. The various components in contact with the acid are made of silicon iron.

Other pumps made by the same company and suitable for corrosive liquids include the *Gusher* pump, an aluminium portable contractors' pump so designed as almost to eliminate wear and blockage, and a centrifugal sump pump for solids designed for handling water containing occasional solids such as encountered in stockyards, basements and underground machinery stores.

Ceramic-lined pumps

To handle highly corrosive or abrasive liquors or delicate liquors where metallic contamination must be avoided, ceramic-lined centrifugal pumps have been designed by Mitchell Craig Pumps Ltd., formerly known as Craig Pumps Ltd. The ceramic lining is inert and resistant to many corrosive liquors except for hydrofluoric acid and hot strong caustic solutions. The pump impellers are of the open type and the pump glands are packed or fitted with a mechanical seal depending on the liquid to be pumped.

Filtration

For filtration duties required in the clarification of industrial and pharmaceutical chemicals uniform delivery under varying heads or pressures is important. For duties of this nature, especially when involving corrosive chemicals, the materials of construction have to be carefully selected. A new filtration pump developed by Mono Pumps Ltd. is lined with ebonite and has *Langalloy* and *Corronel* rotating parts; the pressure head developed is independent of pump speed and therefore a suitable speed can be chosen to relate the pump capacity to the flow rate of the production cycle. This pump can handle a thick suspension of sodium chloride and hydrochloric acid and delivers to a filter press at a maximum pressure of 40 p.s.i.

Control mechanisms

For system controls, frequently used in the chemical and allied industries, *Hydro Titan* hydraulic axial piston units are available. There are 16 units which may be used as pumps or motors depending on mounting and control mechanism. Pump capacities range from 319–2,800 gal./min. at standard speeds of revolution. However, maximum pressures are somewhat high—up to 3,500 p.s.i. for small units and 5,000 p.s.i. for the larger units where intermittent peak pressures are required.

Cleanliness, easy dismantling and reassembly, and freedom from bacterial contamination in the pump head are features of the new rotary easy clean pump, made by Stainless Steel Pumps Ltd.

The pump has splined shafts where rotors are fitted and a standard type "O" ring joint between rotor case and back plate. It is suitable for suction lift and can run on snore or completely dry for several minutes without damage. It handles sticky and viscous fluids and also sensitive liquids without agitation and consequent impairment. The pumps are made in five sizes for capacities from 50 to 10,000 g.p.h., for pressures up to 120 p.s.i. Glands are of the normal packed stuffing box type, but Flexibox or Crane mechanical gland seals can be fitted if preferred.

Flexible coupling

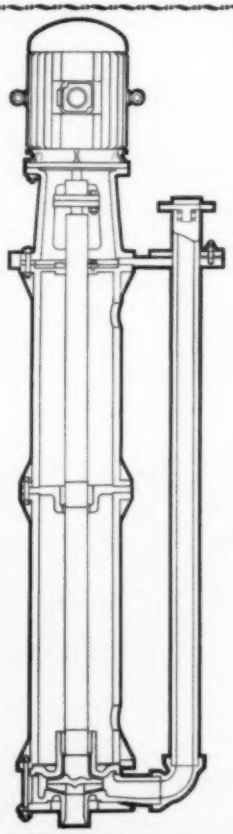
It is obvious that leading pump manufacturers have been busy on

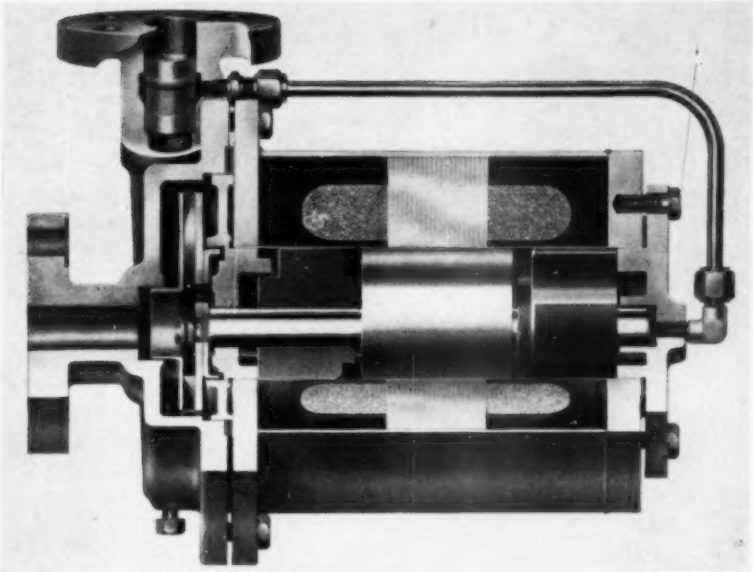
SUBMERGED PUMP

The new vertical glandless submerged pump made by Kestner is intended for internal mounting in tanks and sumps, avoiding the complication of suction piping and eliminating all need for priming arrangement as the pump unit always remains immersed.

The pumps are built around proven hydraulic components, and a wide range of duties is possible. They have been specially designed to facilitate manufacture in Keebush, *Kestner's corrosive-resisting plastic material, and all parts coming into contact with the liquor are made either from* Keebush *or some other plastic material.*

These pumps have been primarily designed for the handling of conc. HCl, but they are equally suitable for use in H_2SO_4 of up to 50% concentration, and many other corrosives. The design is basically simple. The impeller stem which is in Keebush *runs in a PTFE sleeve bearing, whilst the intermediate bearing is made from the same material, but is lubricated with acid under pressure, the supply taken from the pump casing. The PTFE sleeves are carried in* Keebush *housings, and in the event of either the shaft or the sleeve wearing, new sleeve bearings may be fitted after machining the shaft covering to a reduced diameter. The model illustrated is a 2 in. unit which has a suspended length of 7 ft.*





GLANDLESS CANNED MOTOR PUMPS

A cut-away impression of the latest design of Series "G" Chempump, which will be the first of a complete series of glandless canned motor pumps to be produced in this country by Chempump (G.B.) Ltd. The unit consists essentially of a standard centrifugal pump and a standard induction motor built together into a single leakproof hermetically sealed unit. There are no mechanical seals, stuffing boxes, glands or other shaft sealing devices. The impellor is joined directly to the motor rotor by a short shaft extending to the pump chamber. Pumped fluid circulates in the rotor chamber through the external circulating pipe for cooling the rotor, stator and bearings and acting as a wetting agent for the self-lubricating carbon-graphite bearings. The stator windings are isolated from the pumped fluid by a non-magnetic and corrosion resisting liner. Similarly, the rotor is contained in a corrosion resisting can and all parts of the pump and motor coming into contact with pumped fluid are of corrosion resisting material. The pump itself is of the single stage type.

The standard pump is provided with class B insulated motor windings for pumping temperatures up to 200°F. and units can be supplied with special class H installation for temperatures up to 400°F. The stators are filled with dielectric oil to provide heat dissipation in the motor section of the pump. Standard units are available for line pressures up to 300 p.s.i. Other models are available for pumping high-temperature fluids up to 1,000°F. and special high-pressure models are available for pressures up to 5,000 p.s.i. Similar two-stage pumps are also available for heads up to 400 ft.

new developments and designs during the past two or three years in order to meet the growing needs for pumps to deal with more arduous conditions of service with a minimum amount of maintenance and at competitive prices. New problems are constantly facing the pump designer and his work is never finished.

Although emphasis in this review has been on the pump itself, the driving unit such as a motor and above all a flexible coupling connecting the two are also important. Regarding the latter, it is a common fallacy that connecting two shafts together is relatively simple, but very often this is not the case as, for example, where high service temperatures are encountered resulting in shaft mis-alignments and relative axial displacement of the shafts. Consequently, it has become necessary to use flexible couplings which would accommodate such conditions, and various types of coupling have been in use for many years.

Several years ago an all-metal flexible power transmission coupling requiring no lubrication or maintenance was developed. This coupling has been extensively applied in the petroleum and chemical industries. It is capable of accommodating reasonably wide limits of lateral and/or axial mis-alignment together with free axial displacement under conditions of full torque.

Easily cleaned pump

The Centri-Compact pump made by Midland Dairy Machines Ltd. is outstanding for ease of cleaning and inspection of all surfaces in liquid contact. Some manufacturers may change their product several times a day, so quick dismantling of the pump is essential; these pumps can be stripped completely by undoing the pipe couplings, slackening the clamp handle and removing the pump cover and impellor in a matter of 45 sec. A new mechanical seal can be fitted within minutes. A special rotary seal is standard, which is sanitary in design and reliable; alternative seals are available for difficult liquids. To further guard against contamination, there are no rubbing metal parts.

The pump and motor are combined into a single unit making a rugged, compact, efficient pumping unit. The stainless steel components are all highly polished and the motor is finished in acid and alkali resistant rubber paint.

The pumps are used for a wide variety of materials, including liquids as searching as ether and as viscous as syrup to 1·3 poises. Erosive and corrosive liquids and liquids requiring gentle handling are handled equally well.

The efficiency of the pumps is not dependent on wear rings and close fits, so there is no rapid loss of performance due to corrosion and wear.

The pumps work satisfactorily with a flooded suction. A self-priming version with a maximum suction lift of 10 ft. is also available.

Production Engineering. The Institution of Production Engineers has published a new booklet called "Practical Training in Production Engineering." Adequate practical training is one of the three essential requirements for membership of the Institution. The greater interest now being shown in practical training, stimulated among other things by sandwich courses, makes it opportune to re-state the basic principles essential for such training. This is done in the booklet, copies of which can be obtained free from the Institution at 10 Chesterfield Street, London, W.1.

British chemical manufacturers. The 1960 supplement to the 1959 edition of the A.B.C.M. directory, "British Chemicals and their Manufacturers" has recently been published. This supplement provides full details of all changes. Any enquiries for the directory and supplement should be made to the Association of British Chemical Manufacturers, Cecil Chambers, 86 Strand, London, W.C.2.

Pest Control Chemicals

By D. P. Hopkins, B.SC., F.R.I.C.

The case against mixed fertiliser-weedkillers • Difficulties of getting good mixtures • Soil persistence of weedkillers • The intractable problem of red spider mite • Formulating seed dressings • Water weed control • How farmers use cereal weedkillers

Mixing with fertilisers?

SHOULD soil insecticides or weedkillers be mixed with fertilisers? For the farmer today there is considerable attraction when a single dressing will fulfil two purposes. If the matter was as simple as that, its discussion would hardly be necessary. But many people connected with the fertiliser industry or with fertiliser science question the desirability of bringing together into the same product chemicals different in their chemical and physical natures, usually very different in their rates for effective application, and sometimes different (and likely to become increasingly so) in legislative requirements of supply and use.

The advantages derived from single dressings that jointly feed crops and control crop pests may well be lost by lowered efficiency in use. In the development of solid pest- or weed-killing products much attention has been paid to suitability of carrier or filler; it is surely rash to accept, as equally useful, products in which mixed NPK fertiliser materials have fortuitously become the carrier for the pesticide. There is also the major problem of uniformity; when fertiliser materials are mixed, certain variations in uniformity are permissible and these variations do not significantly affect plant-feeding efficiency; but can similar conditions apply to a pesticidal component of a fertiliser mixture?

Thirdly, there is the problem of rate of application; a fertiliser compound, even when designed for one crop or crop-group, should not be used on all farms or fields at the same rate per acre—for example, if farmyard manure is also given or if the crop follows a ploughed-in ley, the optimum fertiliser rate should often be cut by 25 or 50%. If the amount of added pesticide is decided on the basis of a standard fertiliser rate, then changes in rate desirable for fertiliser efficiency will bring undesirable changes in the rate for the weedkiller or soil insecticide. This difficulty can be overcome only if additions of the pesticide to fertilisers are "made to order," but this kind of development cuts right across the economics of modern fertiliser production and its extra cost must remove the economic benefits of the dual-purpose product.

Indeed, the case against these mixtures is so strong that it is difficult to understand why there has been so much commercial development in recent years, *e.g.* in the U.S.A. by about the mid-1950s about 0·75% of the compound fertilisers sold included an admixed soil insecticide.

Technical problems of mixing

A new American paper[1] has studied the mixing problems for chlorinated insecticides and NPK-fertilisers. Laboratory-scale experiments could not produce products in which the toxicant was uniformly distributed, though the standard of uniformity attained was better when the insecticide had been added as a solution than as a powdered material with carrier. There was selective deposition or absorption of the insecticide by different fertiliser materials in the mixture, with marked deposition on the superphosphate portions and on the finer dust particles, *e.g.* on "fines" in sulphate of ammonia. As most fertilisers contain some proportion of "fines" and as this material tends to segregate in handling movements, this preferential deposition on the smallest particles is a definite homogeneity - reducing influence. The practical variations of insecticide distribution found in this work were large enough to make it difficult to control product composition by sampling and analysis. This can become a more serious problem if trade in these dual-purpose products increases and leads to a demand for legislative control of the insecticide content as well as of the NPK content. A careful study of the paper in full version is recommended. It poses the major question—if small-scale mixing projects cannot achieve a satisfactory standard of uniformity, can factory-scale methods be more effective? Admittedly nothing in this research answers that question, but as a general rule large-scale mixing is less precise than small-scale mixing. The commercial development of these dual-purpose products seems to have occurred in substantial advance of the scientific research necessary for establishing reliable methods and standards.

One of the confusing factors is the development of methods for reliably determining amounts of added insecticide or weedkiller in the presence of fertiliser materials. Clearly enough, until analytical determinations are fairly precise it is difficult to appraise the mixing efficiency of any processes used. A recent British paper reports a new method for determining amounts of TCA (sodium trichloroacetate) in NPK fertilisers.[2] This adapts partition chromatographic methods used for separating the di- and tri-acids. It is interesting to note that in the U.S. paper above the analytical method used to determine insecticide amounts was in all cases based upon analysis of organic chlorine—this covered aldrin, dieldrin, DDT and heptachlor additions. It was regarded as a safe method because the fertiliser materials when tested alone did not contain appreciable amounts of organic chlorine.

Weedkiller persistence

The persistence in soils of aromatic weedkillers appears to depend upon the speed with which soil microbial organisms cause molecular breakdown, and a fairly new chapter of research has been opened by an American paper[3] reporting studies of rate of breakdown for numerous halogenated phenols and phenoxyalkyl carboxylic acids. Certain generalities emerged. Thus, no compound with a chlorine atom in the meta-position on the aromatic nucleus was transformed significantly, regardless of the type of aliphatic side chains. With *a*-substituted phenoxyalkyl carboxylic acids, however, decomposition to the point of nucleus rupture depends both upon the meta-position of the halogen and upon the length of the aliphatic acid chain. Previous work[4] has already indicated that 2,4-D and 4-(2,4-DB) are quickly decomposed by soil organisms, but there is much slower decomposition for 2-(2,4-DB), 2,4,5-T, 2-(2,4,5-TP) and 4-(2,4,5-DB).

This 6 ft. wide main drain on Wooden Farm, King's Lynn, was sprayed with Dowpon to control reeds in September 1958. The weeds are dead, there has been no regrowth, and the water now flows unimpeded. Dose was 25 lb. Dowpon in 150 gal. of water per acre applied by hand-lance.

The unconquered mite

A recent British contribution is salutary reading for all who think that chemical control of specific pests can achieve lasting victory.[5] The glasshouse red spider problem, serious now for a quarter of a century, is sometimes supposed to have been brought under effective control by several of the acaricides available today; in fact, the mites in some nurseries are no longer affected by chemicals that gave good control only a few years ago, *e.g.* by azobenzene or organo-phosphorus products. In America if not yet here resistance has also been reported to chlorobenzilate, chlorbenside, Kelthane, chlorfenson and Tedion. The growth of resistant strains from resistant individuals may be encouraged by the use of a particular acaricide as surviving mites enjoy less competitive conditions for expansion.

Growers are advised to ring the changes on the acaricides they use in periodic treatment, even to the extent of sometimes returning to old-fashioned products, *e.g.* white oil. It is also possible that smoke and aerosol methods of application do not always give the complete distribution that is assumed; this has been shown by studies of deposition using tracer-dyes.[6,7] If this can occur when products are used with absolute correctness, the situation for control is far worse if growers do not follow operational procedure accurately; careful supervision of acaricide use is another necessity. But the outstanding requirement is scientific—more research leading to more knowledge of the physiology of the red spider.

Seed dressing formulation

The effect of the non-active materials in insecticidal seed dressings has been studied[8] and it has been shown these other constituents in a dressing exercise considerable influence upon phytotoxicity and upon the persistence of any systemic effect. The variations in these effects could be due in theory to differences caused in the amount of insecticide adhering to the seed coat, to altered rates of insecticide decomposition, or to an altered rate of release for the active ingredient. The seeds tested were of wheat, mustard and sugar beet. The toxicity of the insecticides to seedling plants was reduced by activated carbon, polyvinyl acetate emulsion and a chlorinated diphenyl resin. Polyethylene glycol ethers and polyvinyl alcohol solution also had some toxicity-reducing effect. The two insecticides mainly tested were gamma-BHC and Thimet (with 90%-content of pure diethyl ethylthiomethyl phosphorthiolothionate). The systemic action of the latter was prolonged with activated carbon and with polyvinyl acetate, as tested by the insects, mustard beetle and bird-cherry aphid.

The results obtained indicated that these stickers or carriers did not vary the insecticides' effects because of induced changes in the amount of insecticide on the seed coat. These changes were measured and they were usually much under 10%; the variations in biological activity of dressings were much larger. Nor does it seem that the seed dressings' rate of decomposition is affected; for Thimet, which is less stable than gamma-BHC, was mixed and stored for a year with two of the influential materials and no loss of activity resulted. It is far more likely that the *modus operandi* is a variation of the speed at which the insecticide becomes available for absorption by the young plant and of the speed at which it can be lost by leaching or decomposition. The helpful filler or sticker is one that releases the active substance at suitable speeds for the required duty, *e.g.* at a speed fast enough to maintain a toxic concentration for systemic action, but not fast enough to cause damage to the plant or to promote losses by soil action, washing out, etc. How far formulation can improve seed dressing effectiveness depends upon the insecticide. With gamma-BHC it

was not possible to achieve low phytotoxicity without bringing reduced insecticidal activity, but the more soluble Thimet—which is also a more powerful systemic insecticide—could be satisfactorily formulated to combine low plant toxicity with prolonged systemic properties. However, it should be made clear that this work was carried out for seeds and plants grown in sand, not soil. The effects of fillers or stickers may be less with soil as the medium.

Control of water weeds

Modern work on the chemical control of weeds in water carried out by the Agricultural Research Council has been described.[9] More chemical control is desirable, for manual weed-clearing is increasingly difficult to get done and mechanised methods are limited in their applicability. A major problem is, of course, to avoid contamination of the water by the chemical used. So far dalapon has proved the most satisfactory chemical weedkiller available, but it has a limited range and its use can lead to greater growth of resistant weeds. Dalapon can be applied only to emergent (surface) weeds; even if it gives a good kill of all emergent water weeds, the submerged and unaffected weeds may subsequently take over and provide as serious a problem to the watercourse. Amino triazole has been tried and it has shown water weed control possibilities similar to those of dalapon; amino triazole, however, has a wider range, and it might also kill small river-bank weeds that usefully prevent erosion. Control of submerged water weeds is more difficult; sodium arsenite, advocated in the 1930s, is today not recommended.

A new approach, developed in America, is to use pelleted weedkillers of the 2,4-D type; the pellets confer relative insolubility and so prevent any appreciable concentration of herbicide in the water. Tests with pelleted weedkillers have, however, given rather disappointing results except in farm dykes or ditches where water movement can be prevented with dams. It seems fair to conclude that a satisfactory chemical approach to the submerged water weed problem has yet to be produced. It could prove to be an unrewarding research task even if a successful method or material was found, for there will be considerable public opposition to the use of chemicals in freshwater courses. At the same time the problem of water weeds could become more serious than it already is; two weed-promoting factors are the lessening volume of commercial traffic on inland waterways and the increased use of fertilisers which causes extra plant food to drain into streams and rivers.

The official mark of the Agricultural Chemicals Approval Scheme. "Not very striking" comments D. P. Hopkins

The approval scheme

The new Agricultural Chemicals Approval Scheme, which is voluntary, replaced the somewhat similar Crop Protection Products Approval Scheme last June (1960), and 1961 has brought the first edition of an annual publication, the Scheme's List of Approved Products. Copies are available free of charge from Ministry of Agriculture regional and divisional offices. The approved products are grouped into five sections — insecticides, fungicides, herbicides, seed dressings and miscellaneous products. Under each common-name heading, *e.g.* aldrin, DDT, etc., approved proprietary products and their manufacturers' names are listed. Uses and precautions necessary in use are briefly stated, with emphasis in all cases for which official recommendations or regulations have been issued. It may be premature to comment, but it seems only too evident from the start that any effectiveness this new scheme has for promoting safer handling of the more toxic chemicals must depend upon the circulation and use of the annual list. It requires publicity as well as publication. A mark designating approved products has been created and appears on the cover of the booklet list. It does not seem to be very striking as a design.

Farming use of cereal weedkillers

Attention seems worth drawing to evidence now regularly appearing on the extent to which selective weedkiller use is associated with cereal cropping. This is to be found in the fertiliser practice district reports being issued jointly by the Scottish Agricultural Colleges and the Agricultural Research Council Statistics Unit, Aberdeen.[10] About six districts are surveyed each year with considerable detail about fertiliser use on main crops; all the 1959 surveys, reports of which were published in 1960, included data for use of weedkillers. Taking the five surveys collectively, selectives were used on 164 out of 263 farms where cereals were grown, *i.e.* on 62% of farms. There was a trend for more use of selectives on the bigger acreage farms, to the extent very often that these farms all used them. On the farms using the weedkillers, MCPA was used on 156 out of the 164 farms, though in 17 cases the MCPA was used in conjunction with another weedkiller. On the larger farms this use of cereal weedkillers seems almost as firmly established as the much older practice of fertiliser dressings; whether a similar extent of use is to be found in England is not known, but it might be borne in mind that Scottish farmers have often been more progressive in adopting scientific practices.

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HORMONES and Related Compounds

By R. M. Evans,* D.Sc., F.R.I.C.

Polypeptides from plasma-globulin • Bradykinin • Hypertensins Synthetic ACTH • Insect attractant synthesised

Polypeptides

CONSIDERABLE advances have been made in polypeptide chemistry during the past 15 years. Methods for determining the structure of these complex molecules, and for their synthesis, have been greatly improved, and research on both aspects continues to expand rapidly. Many of the more important mammalian hormones are polypeptides, and the elucidation of the structures of insulin, oxytocin and vasopressin, together with the synthesis of the last two, have been among the notable events in chemistry during this period. In addition to the hormones, a number of other polypeptides also participate in controlling the functions of the human body and examples of both groups will be included in this review.

Synthetic biologically-active polypeptides are of interest and assistance to pharmacologists and endocrinologists, as they replace "natural extracts," which are often ill-defined and of variable potency, by chemically identified and homogeneous compounds. The methods of synthesis also permit the preparation of analogues, in which the nature and sequence of the component amino-acids can be varied; examination of the pharmacological properties of such structurally related compounds has already helped to clarify their modes of action and is opening up the possibility of extending their usefulness.

Polypeptides from plasma-globulin

Certain proteolytic enzymes act on the globulin fraction of normal plasma to produce vaso-active polypeptides. These products have interested both chemists and pharmacologists for the past ten years; during this time the structures of three members of the group—bradykinin, hypertensin I and hypertensin II—have been determined by degradation and confirmed by synthesis.

Bradykinin. In 1949 Rocha e Silva and his colleagues[1] found that addition of either crystalline trypsin or the venom of the snake *Bothrops jararaca* to the globulin fraction of normal plasma precipitated between 35 and 45% saturation with ammonium sulphate liberated a common product that had interesting pharmacological properties. It contracted smooth muscle and produced a marked fall in blood pressure.[2] The rate of muscle contraction was, however, much slower than that produced by histamine or acetylcholine, which is why the new hypotensive substance was named bradykinin. Subsequent studies[3] have shown that it greatly increases capillary permeability, and it is claimed to be the most potent vasodilator known, with 15 times the activity of acetylocholine. It potentiates the hypotensive effects of reserpine and benzyline in animals, but it has no effect on the hypotensive action of ganglioplegic agents such as hexamethonium. The reasons for these interactions are not fully understood, and they are now being studied.

The polypeptide nature of bradykinin was soon recognised;[1] work to determine its structure has been pursued in several laboratories for the past several years, and in 1960 Elliott, Lewis and Horton[4] proposed the octapeptide structure (Fig. 1) for bradykinin derived from the action of trypsin on ox-plasma.

Some months later Boissonnas, Guttmann and Jaquenoud[5] reported the synthesis of the polypeptide (Fig. 1) and five other similar polypeptides but, surprisingly, the synthetic product showed only weak bradykinin-like activity. In contrast, a nonapeptide (Fig. 2) containing an additional L-prolyl residue was found to have pharmacological properties identical with those of "natural" bradykinin.[6] In view of these results Elliott and his co-workers[7] re-investigated the structure of trypsin-bradykinin and confirmed that it was in fact a nonapeptide, structurally identical with the active compound synthesised by Boissonnas and colleagues.

The synthesis of bradykinin (Fig. 2) by Boissonnas and co-workers provides an excellent example of both the classical and the new techniques of peptide synthesis. The order in which the component amino-acids were made to join together is represented diagrammatically in Fig. 3.

Hypertensins (Angiotensins) I and II. In contrast to trypsin, which reacts with plasma-globulin to release a hypotensive agent, the proteolytic enzyme renin produces two hypertensive polypeptides that have

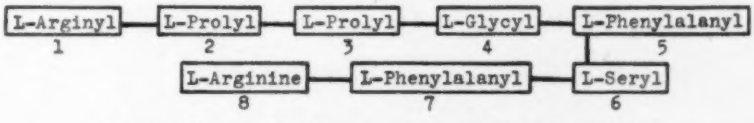

Fig. 1. Octapeptide structure suggested for bradykinin.

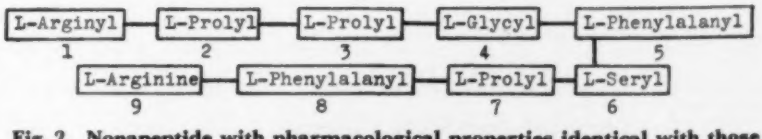

Fig. 2. Nonapeptide with pharmacological properties identical with those of "natural" bradykinin.

* Glaxo Laboratories Ltd.

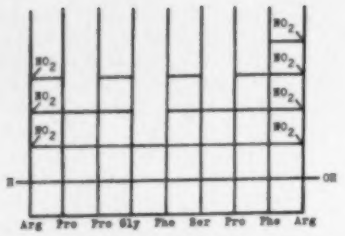

Fig. 3. Order in which component amino-acids join in synthesis of bradykinin (Fig. 2).*

been named hypertensins (or angiotensins) I and II.[8] The work leading to the determination of their structures has been the subject of a recent comprehensive review;[9] the arrangement of the component amino-acids in horse hypertensins is set out in Fig. 4.

It will be seen that hypertensin I is a decapeptide, and hypertensin II a closely related octapeptide lacking the terminal L-histidyl-L-leucine residue. Their constitutions vary slightly with the source of the plasma-globulin. The hypertensins derived from ox-serum differ from the horse hypertensins in the nature of the fifth amino-acid, having the L-valyl instead of the L-isoleucyl residue. This difference in structure does not, however, appear to involve any significant difference in activity.

Elegant syntheses of valine[5]-hypertensins I and II have been achieved by Schwyzer and his colleagues,[10] and the synthetic products have been proved identical with the natural polypeptides. The order in which the amino-acids were made to join up is represented in Figs. 5 and 6.

Hypertensin I is less active than hypertensin II *in vitro*, but both are equally active *in vivo*, and it has been shown that the decapeptide is rapidly converted *in vivo* to the octapeptide by an enzyme present in the blood.[11] The hypertensins, like many polypeptides (*cf.* bradykinin), contract smooth muscle, but the main interest lies in their vasoconstrictor and hypertensive actions.[12] It is thought that the release of hypertensin II may be a factor in hypertension resulting from impairment of kidney function; there is consequently particular interest in determining its mode of action and in the the possibility of synthesising structurally-related antagonists that might be of use in the treatment of this condition.[13]

Schwyzer and co-workers[14] prepared a series of synthetic analogues of hypertensin II and investigated their pharmacological activities; they showed that the first amino acid of the sequence, and to a lesser extent the second (L-aspartine and L-arginine, respectively), are unnecessary for hypertensive activity, whereas modification of the last member (L-phenylalanine), by esterification, oxidation or replacement by the *d*-isomer, caused a marked reduction in pressor activity.[12] Further studies of structural variation and hypertensive activity have been reported recently by workers at the Cleveland Clinic, Ohio.[15] They have found that many changes in the amino acids and their sequence can be made without complete elimination of hypertensive action and conclude that the essential factors for this action are:

(*a*) the free carboxyl group of phenylalanine;
(*b*) the aromatic group of phenylalanine;
(*c*) the phenolic group of tyrosine; and
(*d*) a proline residue at position 7.

It is thought that the three-dimensional arrangement of the molecule may be important, since models show that, assuming a helical structure, the essential groups (*a*), (*b*) and (*c*) all lie on the same side. The authors suggest that the configuration of the molecule is maintained by hydrogen bonding, and support for this hypothesis is derived from the reduction of biological activity produced by urea (a substance known to destroy such bonds). Synthetic hypertensin II is already in clinical use and the results to date have provided a great stimulus to further studies of the therapeutic potential of this group of polypeptides.

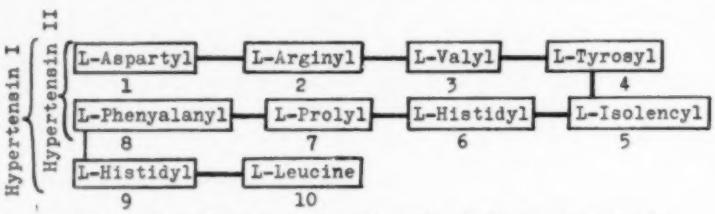

Fig. 4. Arrangements of amino-acids in horse hypertensins.

Synthetic ACTH

The adrenocorticotrophic hormone (ACTH) is produced in the anterior lobe of the pituitary gland; it acts directly on the adrenal cortex to stimulate the production of various corticosteroids (*e.g.* cortisone, aldosterone), which control many vital processes in man and animals. Extracts of the hormone obtained from pituitary glands are used as an alternative to cortisone (except in Addison's disease) and in diagnostic tests for adrenal function. They have also found a place in veterinary medicine for the treatment of ketosis and acute coliform mastitis in cattle.

The sequence of the first 24 amino acids in hog ACTH was established in 1954 by Bell and his colleagues,[16] who two years later demonstrated that this fraction possessed high hormonal activity.[17] The complete sequences for ACTH extracted from the pituitary glands of man,[18] hogs[19] or cattle[20] have been determined. All these compounds show similar

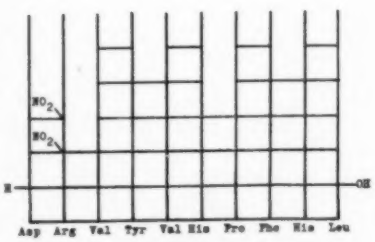

Fig. 5. Valine[5]-Hypertensin I.*

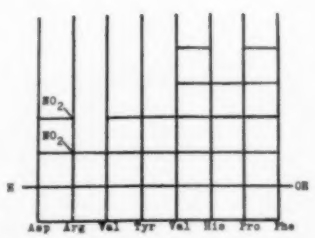

Fig. 6. Valine[5]-Hypertensin II.*

* *These syntheses involve the use of nitro-arginine, which is reduced catalytically to the amino-acid at the last stage.*

The methods used for the protection and linking of the amino-acids are set out with clarity and detail in two publications.[5,10]

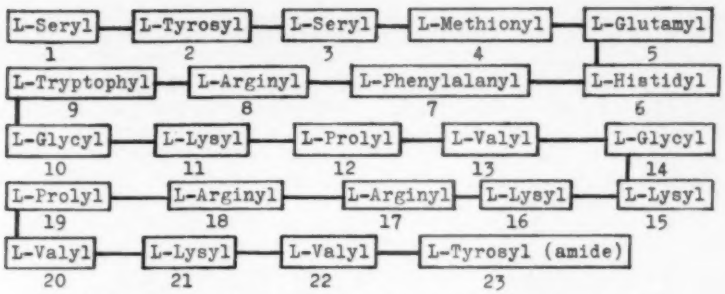

Fig. 7. Polypeptide containing first 23 amino-acids of ACTH.

physiological activity; each consists of 39 amino acids, linked solely by amide-bonds to form linear polypeptides. Comparison of these structures shows that the first 24 amino acids are common to all, whereas the remaining sequences of 15 amino acids vary according to the species from which the hormone is derived. It seemed probable, therefore, that the sequence of the first 24 amino acids is entirely responsible for the hormonal activity.

The synthesis of such complex peptides presents many formidable problems, in methods of synthesis and in techniques of manipulation and separation. Nevertheless, early in 1960 Hofmann and his colleagues[21] announced the preparation of a hexadecapeptide, but the product had only 0·1% of the activity of ACTH. In October of the same year, Li and his co-workers[22] published details of the successful synthesis of a polypeptide containing in proper order the first 19 amino-acids of ACTH, which on assay showed 30% of the activity of ACTH. Finally, to crown this year of success, Hofmann and his colleagues[23] of the Pittsburgh School of Medicine announced in December the preparation of a polypeptide comprising the first 23 amino acids of ACTH (Fig. 7); it is as active as the natural hormone.

This compound is the largest polypeptide yet synthesised and its preparation undoubtedly foreshadows further and rapid advances in this field.

The sex attractants of the gypsy moth

The isolation and synthesis of two substances involved in the sexual development of honey bees was noted in the previous review.[24] More recently, workers at the Entomology Research Division, U.S. Agricultural Research Service, have determined the nature of the sex attractant of the female gypsy moth (*Porthetria dispar*. L.), which is secreted by the female to lure the male moth for mating.[25] Benzene extraction of the last two abdominal segments from 500,000 virgin female gypsy moths gave 75 mg. of a pale yellow, viscous oil, which in chromatography yielded 3·4 mg. of a white waxy crystalline substance, found by field tests to be attractive to males in quantities less than 10^{-7} μg.

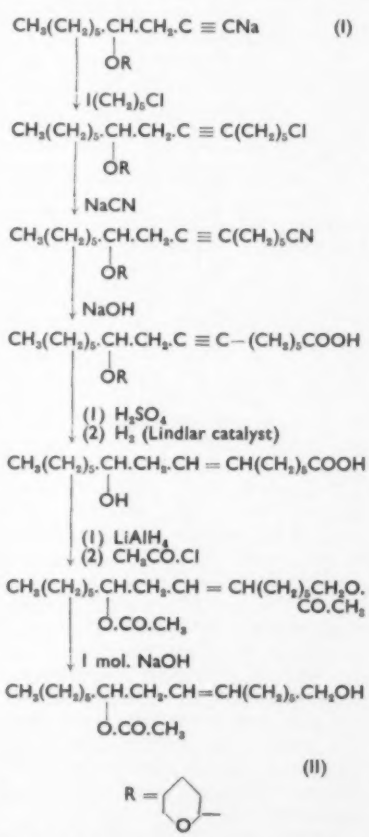

Fig. 8. Synthesis of sex attractants of the gypsy moth.

By the elegant use of micro-techniques this amazingly potent substance was shown to be (+) 10-acetoxy-*cis*-hexadeca-7-en-1-ol (II, Fig. 8), and the structure was confirmed by synthesis of the racemic form from the sodio-derivative of dec-1-yn-4-ol pyranyl ether (I) as follows. The (+) and (±) forms of (II) showed approximately the same activity in field tests.

This is the first synthesis of a naturally occurring insect attractant, and the synthetic material may prove useful in helping to control the Gypsy moth in areas where it causes damage to woodlands and shrubs.

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THE SCENT OF FLOWERS AND LEAVES *A Search for Fragrance among the Minor Natural Orders*

By Edward S. Maurer, F.L.S., M.R.I.

4. The Borage Family *(Boraginaceæ)*

The most important odoriferous member of the borage family is heliotrope and this article is largely concerned with this osmical motif. Other members of the family produce odours of heliotrope, almond, honey and honeysuckle. Some produce materials of possible cosmetic use, and from others fixatives might be derived.

THOSE who have a working acquaintance with the flora of our waysides and woodlands will easily recognise the somewhat uncouthly-named viper's bugloss with its spikes of " litmus-like " flowers, which on their first opening are bright red, graduating to a brilliant blue as the plant develops. This is one member of the borage family. The garden lover will think of anchusas with their vivid gentian-blue blossoms, various heliotropes and numerous forget-me-nots.

The family comprises some 90 genera and upwards of 1,600 species of plants, principally natives of the temperate regions of the northern hemisphere, and some shrubby trees of Asiatic origin. As we explore, we find instances of some unusual fragrant liaisons, as well as evidence of henna-like pigments and therapeutic substances which may be of cosmetic interest.

The borage family once supplied more mediaeval herbs than any other family. Many species—like the mallows—abound in soft mucilaginous juices, on account of which the common borage has long had the country name of " cool tankard," for the juice expressed from the bruised rough green leaves, as Mrs. Frances A. Bardswell describes in her " Herb Garden," " . . . gives an etherealised flavour of cucumber to claret and other cups." Even in these prosaic days, in the more select alcoholic buffets gin-laced lager is garnished with a token sprig of blue anchusa.

Etymology

Borage, or Burrage, was noted by John Partridge in his " Treasurie " (1586) as one of the four " Cordial Flowers," " . . . most worthy of my esteem for cheering the spirit. . . ." Linnæus suggested that the name is a corruption from the Latin *cor*, the heart, and *ago*, meaning to act quickly, from its use in medicine as a rapid heart sedative.

There are some half-dozen ornamental species for the garden which emphasise the prickly stems and bristly leaves so characteristic of the family.

In an eighteenth-century British " Flora medica " it is noted that a strong decoction of the leaves of this genera, after evaporation to a semi-soft extract, gradually effloresces from the heavy saline content of the juice, the residuum having a very strong oakmoss-like odour.

The genus Echium

E. vulgaris is the common viper's bugloss, also known in N. America as the blue Thistle or snake-flower. The generic name comes from the Greek *echis*=a viper, because of a fancied resemblance of the seeds to a snake's head. The descriptive anglicised word is derived also from the Greek *bous/glossa*, signifying an ox's-tongue, from the shape and roughness of the leaves.

Although the garden manuals offer upwards of 70 ornamental annuals and biennials, there does not appear to be any strong nuance, but as a whole the flowers are stated to be melliferous and thus very attractive to bees.

Two books are valuable for their descriptive fragrance references. These are " The Canary Islands " (1911) and " Flowers and Gardens of Madeira " (1926) as painted and described by Ella and Florence Du Cane.

In dealing with the peculiar local flora the writer remarks: " Here at Santa Ursula, great interest is taken in the *Echiums*, another race of Canary plants. *Echium simplex* must be afforded first place, as it is commonly called ' Pride of Teneriffe '; it bears one immense spike of white flowers, and like the aloe, after this one supreme effort the plant dies."

From other sources I have some evidence that these giants, like some of the island yuccas and magnolias, have a honey-almond nuance.

The genus Lycopsis

This is another blue-flowered " bugloss "; it derives its name from the Greek *lykos/ops*, literally wolf-eye, because of a fancied resemblance of the flowers to the eye of a wolf. An allied species is *Alkanna tinctoria*, which gets its name from the Arabic for henna, namely *al khana*, and early known in Europe as the Dyer's or Spanish bugloss, the roots yielding a permanent red pigment which will dye hair as well as all animal and vegetable tissues. This proclivity is again perceived in *Anchusa arvensis*, the seaside or small bugloss, the name in Greek signifying a brown cosmetic stain.

There are upwards of 40 ornamental species, remarkable for the beauty and form of their deep blue blossoms.

Miscellaneous genera

Symphytum: There are some

25 species of this genus, of which *S. officinale* is the common comfrey of our countryside. The interpretation of the Greek name is helpful, for it indicates an " ability to unite," while the common name is derived from the Latin *confirma*, from its strengthening properties; these may be judged from some of its county epithets such as bone-set or knitbone, for as a compress it has a reputation since early times of rapidly reducing the inflammation attendant upon bone fractures and to accelerate setting and healing. I have come across several instances of native African employment of the local species, and these reputed qualities are not so surprising when it is seen that these plants contain appreciable quantities of allantoin, which in recent years has come to be known as a stimulant for tissue growth.

Although this genus is perhaps lacking in osmical interest, yet as a cosmetic chemist I am taking the opportunity of noting any item which may be worth examining for its potential cosmetic usage.

The Gromwells: This name covers several allied species. The common country name may be seen in the Anglo-Saxon *graum*, meaning a seed, and *mil*, indicating a stone; this is noted in the botanical name *litho/spermum*, the significance of which is aptly illustrated by several of the American yellow-flowered Puccoons, for the seeds when formed are like small, hard, round, polished pearls or white stones. *L. officinale* is the common gromwell, grey-millet, lychwale or pearl-plant; there are upwards of 20 ornamental varieties for the garden. An interesting footnote mentions that the grains upon being mingled, for example, with lavender heads, absorb and retain the fragrance long after the source has been removed; we may therefore have here something unique in fixatives which may be worth further investigation. *L. prostratum* is the French or blue-gentian gromwell, *L canescens* the N. American golden gromwell, while the yellow-flowered *Onosmodium hispidum* and the white *O. molle* are the N. American false gromwells or bristly marble-seed plants. Like the foliage of the walnut, these gromwells may well yield a new approach to vegetable hair dyes.

Arnebia: *A. echioides* is the Russian bugloss or spotted golden borage. The generic name is the Arabic for " prophet's flower," so termed because it has yellow flowers with five black dots; these are the " Marks of Mahomet," which fade as the blossoms age. They are, however, scentless, but we may note that *A. decumbens* is mentioned by Violet Dickson in her " Wild Flowers of Kuwait," (N.E. Arabia), the roots of which afford a permanent rouge for native women; while *A. sericostoma* is one of the several " Desert-star " flowers, the pink and yellow blossoms of which are reported to have a faint musky scent.

Pulmonaria: *P. officinalis* is the common lungwort of our countryside and is known in some counties by a variety of names such as bugloss-cowslip and " Joseph's coat of many colours," because of the bizarre red and blue colouring of the flowers. These share with the 30 or so ornamental garden plants a sweet, faint honey-like scent, but I have observed that the juice expressed from the wild lungwort has a particularly strong, cucumber-like odour which persists on a blotter for many days.

Mertensia (after Mertens): There are several interesting species of this allied genus, for example *M. alpina*, the smooth or Alpine lungwort, while *M. maritima*, which is the sea bugloss, also known as the oyster-plant for the foliage, is reported as having an aminic or fishy odour. The scentless *M. virginica* although known as the virginian cowslip, is so named from its physical resemblance to this plant.

Cyno/glossum: This is the common hound's-tongue, *kyon* being the Greek for dog and *glossa*=a tongue, referring to the shape of the leaves, which when dry are faintly aromatic. It has small crimson flowers which produce seeds covered with short, stout, hooked spines which cling tenaciously to fur, feather and cloth—stickseed or lappula (little bur) being the names of some closely linked N. American species, allied to which are the *Echino/spermums*, the hedgehog-seeds. *C. montana* is the only other British species, but these " Gipsy-flowers," as they are sometimes called, exhale a disagreeable acetamidic mousy smell, but the roots of all these afford a somewhat nauseous herbal narcotic odour of considerable persistence, and once again this group may be added to the list of potential fixatives.

Among the upwards of 30 ornamental species for the garden may be noted the N. American *C. virginica*, the woodland or wild comfrey, while *C. suaveolens* is one of the several Australian hound's-tongues, the foliage of which has the coumarin-like redolence of the asperulas or woodruffs. This is also noticed among the rough-leaved *Asperugos*, *A. procumbens* being the purple-flowered German madder-wort.

Omphal/odes: This Greek name *omphales/eidos*, meaning navel-like seeds, describes the fruit of a dozen or so European wild species, but the most striking of the cultivated varieties is *O. linifolium*, the flax-leaved Venus'-navel-wort, the white blossoms of which early in the day have a sweet honeyed redolence.

Myos/otis: From the Greek *mys*, a mouse, and *otis*, an ear; this is descriptive of the fancied resemblance of the upper part of the leaves. *M. palustris* is the familiar " Forget-me-not," regarding which there are many sentimental legends to explain the sobriquet. There are upwards of 40 white and blue-flowered marsh and garden species which appear to be scentless, but Miss Rohde in her " Scented Garden " tells of a friend living just within the Arctic circle who found a sweetly-scented species believed to be *M. alpestris* with a delicate honey-like fragrance, a similar nuance also observed in *Myosotidinum nobile*, the dark blue-flowered giant forget-me-not, or Chatham Island lily of New Zealand.

Cerinthe: This is the great honey-wort of the Levant, the name being derived from the Greek *keros*, wax, and *anthos*, a flower, referring to its being a favourite blossom with the bees, whence in French *le mèlinet* and Anglicised from the Italian *cerinta*. There are about a dozen cultivated varieties, among which is *C. aspera*, the French rough-leaved and the Spanish wax-plant, all of which have a strong honey-honeysuckle scent.

The heliotropes

In the Greek *helios* is the sun and *tropo*, the verb to turn, the flowers turning towards the sun. This sun-turning proclivity is, of course, not limited to this familiar violet-blossomed fragrant plant, but it is still known in some of the earlier texts as Turnsole, from the French *le tournesol*.

The commonest plant is *H. Peruvianum*, introduced into Europe about 1750, but the Greek name was bestowed upon some of the earlier known white-flowering varieties such as *H. Aegyptiacum*. The garden books

offer upwards of 30 varieties, among which is *H. fruticosum*; this is the fragrant basket-withy of Jamaica, while *H. indicum* is the wild clary of N. India.

There is also an interesting division of the summer and winter heliotropes, and, oddly enough, a large selection of white and pale blue "lady-named," varieties such as The Queen, Duchess of Edinburgh, Diana, Lady Molesworth and Mrs. Lewington.

The heliotrope fragrance

I regard the fragrance of the heliotrope as one of the prime odours. Opinions in print are diverse: some suggest "almond-like," others favour "similar to vanilla," then there is the old country name of "Cherry Pie" I would remark here that the oven temperature reached during the baking process releases a fragrance somewhat different from that observed by merely stewing the fruit, and this in its turn is not the same as that of the freshly expressed juice of ripe cherries.

An alcoholic infusion of the flowers is still used in Spanish pastry and confectionery in preference to ratafia or almond essence.

In Northern Europe we are perhaps accustomed to the bedding-out of the comparatively small plants, but in Southern France the heliotrope is used for making hedges, and in India it attains a height of 10 ft. upwards and is described in the local floras as "bearing trusses of small blue flowers, so well known for their vanilla-like fragrance."

Also worthy of note is *H. curassavicum*, the Argentine *Yerba Meona*, this is the strongly almond-odoured wild heliotrope-agrimony. In an E. African flora reference is made to *H. zeylanicum* as "a greyish, shrubby plant with cymes of white star-shaped flowers, the vanilla-like scent of which is so strong and heavy that one feels stifled when walking through it."

Extracts from the blossoms are not a regular item of commerce, but it is interesting to note that the active donator of the fragrance is heliotropine, sometimes listed as piperonal aldehyde and chemically expressed as 3,4-methylene dioxybenzaldehyde. This has been known for nearly a century, being first obtained from pipertine ex black pepper.

It was only, however, when it was found that it could also be obtained by the oxidation of iso-safrol from the cheap and abundant sassafras oils that it has gradually become an item of considerable annual consumption, particularly for soap and industrial perfumes, but all texts advise keeping the crystals in a cool dark place before using. It is light-sensitive and quickly develops a reddish-brown tint.

A simple alcoholic solution of heliotropin crystals has a dull, flat and perhaps a somewhat disappointing fragrance, far removed from the scent of the living blossoms, but in passing we may note that this aldehyde is an integral part of the nuance of the meadow-sweets, false acacias and some of the wild bergamots, which affords us a hint of the types of fragrance which may be used to enhance the odour of heliotropin crystals.

Heliotrope perfumes

If we first turn to the recipes of the Victorian era perfumers we are informed that an imitation of heliotrope was based upon extracts of vanilla, French rose, orange-flower and ambergris, shaded with a trace of bitter almond oil. The texts further inform us that: "A preparation made in this manner under the name of *Extrait de Héliotrope* is that which is sold in the shops of London and Paris, and it is really a very nice perfume, passing well with the public for a genuine extract of heliotrope."

For practical purposes it is convenient to have a general-purpose compound, and among the dozen floral prototypes suggested by R. Glenk (*J. Amer. Pharm. Soc.*, 1924, 1011), the formula for heliotrope is one of the best I have examined for fidelity, body and floralcy. This is based on heliotrope 47, geraniol 20, phenylethyl alcohol 10, coumarin 10, vanillin 5, hydroxy-citronellal 5, and benzyl acetate 3%.

Literature

The literature concerning this flower is very meagre, the monograph in W. A. Poucher's Vol. II still being the most informative, but attention is directed to the various formulæ elsewhere regarding the heliotrope concretes and amorphous heliotropins which embody the supporting assistance from aubepine, the coumarins and vanillins and benzaldehyde, and are of considerable help in introducing a sweet note into almost any type of compound.

False and other heliotropes

There are several fragrant genera in the family which are known as the false heliotropes, for example *Tournefortia* (after Tournefort), of which *T. velutina* (*argentea*) is the E. Indian velvet-leaf, *T. bicolor* is another of the basket or white hoop-wythes of Jamaica, while *T. heliotropioides* is the Brazilian summer heliotrope—the winter heliotrope being *Petasites fragrans*. There are also several S.E. African borages, such as the *Trichodesma*, *Vaupelia*, *Lobostemons* and *Ehretia*, having an almondy fragrance, as well as some 30 European species of the genus *Onos/ma*, the name derived from the Greek *onos*, meaning an ass, and *osme*, a smell, these animals apparently having a liking for the succulent foliage of these small plants, the white flowers of which have a sweet almond-honey scent which is particularly evident in *O. tauricum*, the yellow-flowered N. American "Golden-drop," and again in evidence in the Mexican *Macromeria exserta* and in *M. Jamaicense*, the B.W.I. white-thorn.

Finally we come to the S. American and E. Indian *Cordias* (*cor* meaning heart, *see* the references in the borage etymology). This is a genus of shrubs and small trees, most of the 15 species bearing handsome highly-scented orange and scarlet blossoms. This is a group which in my opinion would well repay investigation, judging from the appended descriptions which have been extracted from C. McCann's "Trees of India" (Bombay, 1948):

C. collococca—Turkey-berry tree, the clammy cherry (B.W.I.).
C. cylindrustachya—Black sage of Brazil.
C. elliptica—The West Indies manjack or broad-leaved cherry.
C. geranchanthus—The fragrant white-flowered Dominican rose-wood or Panama laurel.
C. globosa—W. Indies gout-tea-tree.
C. subcordata—The tow-tree of Tahiti.
C. Myxa (*latifolia*)—The Assyrian, Sebestena or Bhokar plum.

Regarding the latter it is remarked that: "The flowers open in the evening and fade next day, at first white, they gradually pass to a creamy and finally brown tint and are very heavily scented." These tropical Asian plum- and cherry-like blossoms may perhaps be assumed to share the fragrance of *C. nivea*, which is reported as having "a scent somewhat like a mixture of almonds, honey and heliotrope."

NEWS AND VIEWS OF THE U.S. PHARMACEUTICAL INDUSTRY **by Rolf Silken**

More FDA regulations revised, interpreted and postponed ★ Fewer new drugs and slowdown in NDA clearance —or What came first, the chick or the egg? ★ Curb on exaggerated, pseudo-scientific advertising ★ Generic names or brand-names? ★ New drugs ★ Cautions.

NDA requirements

THE New Drug Application form has been revised: it now includes space for the statements to be made in respect to the already effective new requirements regarding promotion and labelling of new drugs. However, the new forms will be replaced by others later in the year, when all of the many Food and Drug Administration regulations now delayed or in preparation will become part of the FD&C (Food, Drug and Cosmetic) Act. The revisions in the NDA form which is to be used during the next few months include these four commitments of the applicant:

Limitation of promotional and advertising claims to those approved in the NDA;

Listing of all hazards, side-effects, contra-indications and caution or warning statements wherever indications or dosage of the drug are mentioned in any kind of labelling (which includes inserts and most types of advertising);

Submission of a supplemental NDA whenever any change, however minute, is contemplated in the statements, facts and figures of the original NDA;

Marketing of the new drug not to be started before the FDA has inspected production methods, facilities and controls, if it addresses such a request to the manufacturer.

Fewer new drugs

The FDA is trying to defend itself against the accusation that its NDA handling has slowed down. The multitude of often expensive and time-consuming answers required by the FDA before clearing an NDA makes it understandable that not only the number of NDAs submitted is on the decline, but also the number of approvals. The NDA requirements include often minute details and disclosure of all available (plus additionally requested) facts and figures on chemical-analytical and bioassay procedures, various toxicity data, results of safety and efficiency investigations, carcinogenic screening, pathological findings, etc.

No wonder then that, in 1960, 14·4% fewer NDAs (for human use) were submitted than in the year before—321 instead of 375. On the other hand, only 165 (or 51%) NDAs became effective against 231 (or 62%) in 1959. Of the remaining 156, 82 were pending at the end of 1960 and 74 were listed as "incomplete," withdrawn, or rejected. It is not difficult to predict that this discouraging trend will continue in 1961 if the NDA regulations and official interpretations remain as stiff as they are now.

The FDA claims that this trend is not as much due to the closer examination of NDAs, but to a slowdown in the pharmaceutical industry's research work. As I see it, there is a trace of truth in this interpretation — many manufacturers are scared to invest time and money in projects which may not develop into saleable products for years to come, if ever. Some day, both FDA and drug industry will learn to see each other's problems and work together on solving them: this time must come in the not too far future, or the U.S. will lose its leading position in the drug field.

Copywriters curbed

The full-disclosure requirements of the very strict new regulations of the FDA and FTC (Federal Trade Commission) make it necessary that drug advertisements include information on side-effects and dangers, together with cautions and warnings. These requirements caused the industry many headaches—yet some of the more responsible manufacturers admit that regulations have become necessary. Too many irresponsible advertisers allowed their "creative," "aggressive" and "initiative" advertising people to make exaggerated claims in flowery language, without even consulting their scientists, who are aware of the true indications and limitations of their products. I know of leading pharmaceutical firms that stopped all their advertising contracts for a few weeks or even months, to gain time to review their copy and comply with the new regulations. Now one sees advertisements that are free of stupid comparisons and impossible claims; and some are already free of the half-witted slogans which have been used by high-pressure salesmen for too long.

Here is a random selection of pseudo-scientific advertising claims; not to have to hear or read them any longer, is worth the high price the industry has to pay for this relief:

"If you have Asian flu and need a laxative, take X."

"Its colour is whiter than white."

"It's 99·99% pure."

"Stomach acid will burn a large, gaping hole, with charred edges, in a cloth napkin." (With demonstrations.)

"Everyone ought to take a multipurpose vitamin pill a day to protect himself."

"By taking a little Z (sea water) a day we can . . . offer our bodily glands a chemical smorgasbord . . . helping them . . . to produce the manufactured secretions that guard our health."

"X vitamins can banish those weary blues caused by nutritional deficiency . . . treat middle age decline, premature aging and depression, improve eyesight, teeth and bones, boost the blood, and revitalise the system."

Generic names wanted

In my opinion the requirement of the qualitative and quantitative disclosure of the composition of prescription drugs, on labels and in most promotional literature and advertisements goes further than necessary, but it has already been modified somewhat.

On the other hand, a Bill recently introduced in Congress would make it obligatory to include in advertisements the generic name with that of any brand-name drug. Naturally, the drug industry is opposed to this bill.

Senator Kefauver however has been calling for generic name drugs for a long time. The Senator claims that generic name drugs are as good as the more expensive private brand-name drugs which most physicians prefer to prescribe: they claim that the manufacturer's brand on his product is a guarantee of high quality, reliability and uniformity in composition and therapeutic efficiency.

New drugs

Enovid (Searle), the first oral contraceptive, is a hormone preparation which has just now been permitted by the FDA for sale in this country. It is 17 alpha-ethynyl - 17 - hydroxy - 5(10) - estren - 3 - one. (Experiments indicate that the hormone contraceptive also inhibits cervical cancer.)

Norlutin (Parke-Davis), another oral contraceptive, is used experimentally by physicians.

Choloxin (Baxter) is an oral anti-cholesterol drug marketed in Canada and test-marketed in the U.S.

Dr. Sabin's oral poliovirus vaccine will not become available in the U.S. for the 1961 polio vaccination programme; one reason is that the industry is hesitant to put great efforts behind this product which has the endorsement of the Government (and is widely used abroad).

Too much Government control . . . cautions and warnings

" Not for pediatric use " is a caution which the FDA now requests to be printed on labels of all streptomycin combinations. Severe toxic respiratory disturbances and nervous system depressions have been observed in children treated with penicillin - streptomycin combinations. This danger exists also for dihydrostreptomycin (which, in addition, can cause severe deafness). Fixed ratio combinations of these antibiotics should no longer be used to treat bacterial respiratory infections. These conditions respond to penicillin, erythromycin, or tetracycline preparations which do not cause the fore-mentioned side-effects.

Marsilid (of Hoffman-LaRoche), an antidepressant, has been taken off the market because it was found to cause liver disease. The FDA declares the danger outweighs the usefulness of the drug. This ipromiazid preparation was introduced in 1952 for TB and was later found to be effective in stages of depression.

Chemicals in the Commons

Disinfectant for Bank Notes?

By Our Westminster Correspondent

EXPERIENCE in this country did not suggest the need for bank notes to be impregnated with disinfectant, it was stated by the Chancellor of the Exchequer, Mr. Selwyn Lloyd.

An M.P. had said that research by the National Institute of Hygiene in Paris had disclosed that after a few weeks' circulation currency notes accumulated a considerable bacilli content which might be infectious, and that steps had been taken to incorporate a special disinfectant in bank note paper in France.

Prescription charge protests

Up to last month about 900 individuals and organisations had protested to the Minister of Health about the increases in Health Service charges, it was reported. The Government's action in raising the prescription charge to 2s. brought a spate of questions from Opposition M.P.s and led to many heated discussions.

Mr. A. E. Oram (Labour, East Ham, S.) suggested that 243 items on the British National Formulary cost less than 2s. Patients were being asked to pay more than the retail price for nearly half the items listed in the Formulary. Miss Pitt, Parliamentary Secretary to the Ministry of Health, insisted that the number under 2s. must be quite small and mentioned calamine lotion, zinc ointment, aspirin tablets and compound codeines. Many of the 567 B.N.F. preparations were listed in several strengths, which affected their price.

Cold viruses

The Common Cold Research Unit of the Medical Research Council had made an important advance in the study of the common cold with the successful isolation and growth of certain cold viruses, stated Mr. Denzil Freeth, Parliamentary Secretary for Science, which is a new Commons post.

" Radio " pills

Another development mentioned by Mr. Freeth was the electronic capsule known as the " radio pill." When swallowed this converts physical and chemical changes occurring in the gastro-intestinal tract into electric signals which can be recorded externally, yielding information about conditions inside the body difficult to obtain by other means.

Chemicals and wildlife

A report on wildlife deaths connected with the use of toxic chemicals was debated. Mr. Soames, Minister of Agriculture, said that the issues raised in the report had been considered at a meeting with representatives of interested organisations, including those responsible for the report. A statement issued afterwards recorded measures which had been agreed for dealing with the problem, including a special survey of wildlife casualties, with post-mortem examinations. The report was also being studied by the research study group.

Mrs. Joyce Butler (Labour, Wood Green) suggested that as a matter of urgency, while these other measures were being considered, the Minister should send out a supplement to his list of approved chemicals drawing attention to chemicals like *Dieldrin* which were particularly dangerous and needed special care in handling. The Minister replied that a circular had been sent to National Farmers Union members. Another was being sent out by the Association of Corn and Agricultural Merchants to their members about the dressing of seeds.

Bracken control

Asked about progress in the chemical control of bracken, Mr. William Vane, Ministry of Agriculture Parliamentary Secretary, said they had been keeping in close touch with trials carried out by the Agricultural Research Council's Weed Research Organisation. These did not as yet provide conclusive evidence of the degree of effectiveness of chemical control of bracken.

Deadly insecticides

Information about sales of insecticides with choline-esterase inhibitor properties was not available, said Mr. Vane, Agriculture Ministry spokesman, when questioned by Dr. Johnson (Conservative, Carlisle). In 1960 the accidental death of a scrap-yard worker was attributed to the residue of one of these chemicals in used containers.

▶AUTOMATIC CARTON UNPACKING

A new development by Dawson Brothers Ltd. is a fully automatic carton unpacking machine. It is believed to be the only one designed and manufactured in Britain.

These machines are being installed in the new fully automatic bottling plant for Domestos Ltd., at Newcastle upon Tyne. They will remove the bottles from the cartons and place them on conveyors leading to the Dawson *New Super* Hydro bottle washing machines, *via* de-stoppering units. Each of the bottling lines will have an output of 9,600 bottles/hr.

They are available with single, double or triple heads to handle up to 24 cartons/min., and can be for remote operation, as in the Domestos installation, or for placing bottles directly on to the magazine loader on the bottle washer. Almost any range of bottles can be handled from ⅓ pt. to 1 qt. and ¼ l. to 1 l. Alternative grab heads and locating frames can be supplied for quick change-over to different bottle sizes. Similarly, simple adjustments on the conveyor allow for different sized cartons, as well as wooden cases or boxes.

At the entry side of the machine (which can be left or right) the cartons are transferred from a powered roller conveyor at accurately synchronised intervals on to a drag bar conveyor. The drag bars are spaced to suit the grab heads, and using a special drive arrangement the cartons are halted in the unloading position. Fitted across the conveyor immediately above the crates are special locating and stripping frames. When the grab heads descend they press the locating frames down into position over each carton, and this squares up the sides of the cartons should they be sagging, and also prevents loose partitions coming out with the bottles.

The bottles are lifted clear and are then moved horizontally to the release position, where they are gently deposited on the multi-lane bottle conveyor. In severe tests the machines handled cartons which would normally be considered sufficiently dilapidated to be scrapped. The results were just as good as when new cartons were being used.

When flaps are involved a device is fitted which tucks the side flaps down the sides of the carton as it moves to the unpacking position. The end flaps should already be turned down when the cartons are placed on the conveyor.

Cartons may travel through sideways or lengthways. Although the common method is lengthways, in the Domestos installation the twelve-bottle cartons are handled sideways to facilitate feeding the double head de-stoppering machines.

▶FLOW CONTROL

A valve for use in flow systems as an on/off control where the maximum flow rate is 525 ml./min. at 60 cm. head of water has been marketed by Griffin and George Ltd. called the Grundy solenoid valve. It is a cylindrical glass valve with a metal-cored glass plunger, actuated by a concentric solenoid from a mains control unit. It is 110 mm. long and 16 mm. in diameter, with rifled extensions to accommodate 5 mm. diameter tubing.

The cylinder contains a metal-cored glass plunger with a ground glass plug at one end which fits into the ground surface at the constricted outlet of the valve. The glass valve is mounted through the solenoid which is housed in a metal casting, 90 mm. in diameter, 57 mm. long, with an integral bosshead to accommodate rods of up to ½ in. in diameter.

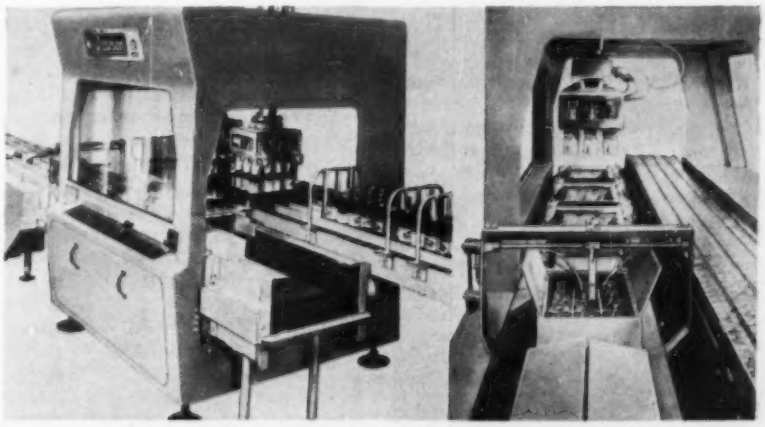
The control unit, housed in a sheet metal case 6¾ in. wide by 9 in. in depth, is a step-down mains transformer tapped at 12 V. with three circuits for controlling simultaneously (up to) three solenoids for operation on 200/250V at 50 cycles a.c. The case is fitted with a white inclined front panel carrying a push button on/off switch with an indicating light for each solenoid, a mains on/off switch and a pilot light. The control panel and solenoid are in a synthetic hammer enamel finished case.

▶ACID PUMPS

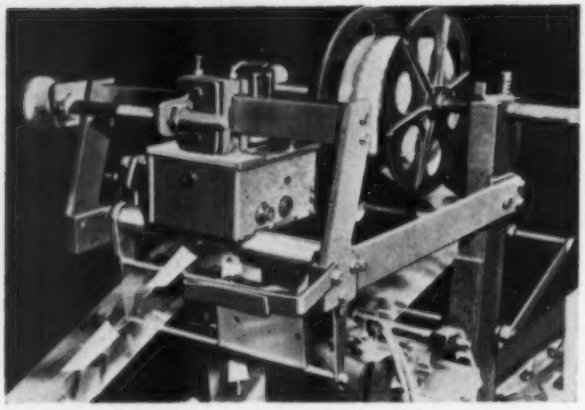
L. A. Mitchell Ltd., Manchester, have arranged for their range of chemical stoneware acid pumps to be manufactured by Mitchell Craig Pumps Ltd. (previously known as Craig Pumps Ltd.) of Glasgow.

In addition to the existing range of Mitchell pumps, new and improved designs are now being developed which will be known as Mitchell Craig pumps. All sales of these pumps will be handled by L. A. Mitchell Ltd., from whom full information can be obtained.

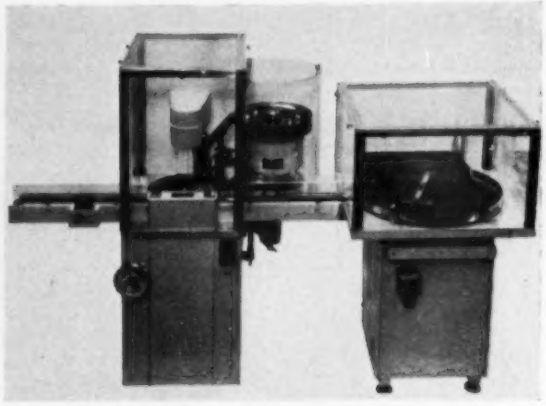
The board of Mitchell Craig Pumps Ltd. will include L. A. Mitchell (chairman), M. D. Craig (managing), J. N. Mitchell and F. Kelly.



The Dawson automatic machine for unpacking bottles from cartons. *Left:* **Bottles being placed on the conveyor belt after being lifted from the cartons.** *Right:* **The special plough arrangement for handling cartons with flaps—the flaps are turned back as the carton reaches the unpacking position.**



Series 700 Rolaprinter flexographic imprinter for web fed wrapping machines made under licence in this country by Mark-o-Print Ltd.



The Autopack high-speed capping and filling machine designed for disc-sealing antibiotic vials at speeds of up to 100/min.

▶THIN-LAYER CHROMATOGRAPHY

Thin-layer chromatography is an adsorption-chromatographic quick method which makes possible the separation of minute amounts of substances, by micro methods, in not more than 30 min. on a path of only 10 cm. The carrier material consists of special glass plates which are prepared with a purely organic, firmly adhering, layer of silica-gel "G" Merck of 275 μ thickness. On a normal plate ten separations can be carried out simultaneously. After use, silica-gel "G" layers can easily be rinsed off the plates, which are then ready for further experiments. Coated glass plates can be compared with "open adsorption columns"; *i.e.* a change from the close column method of Tswett to an open column method, modified as above.

The principal uses of the thin-layer technique include:

1. Separation of lipophilic substances.
2. Comparison of natural and synthetic mixtures, *e.g.* essential oils, resins, waxes, fatty dyes, tars.
3. Tests on homogeneity of fractions.
4. Rapid determination of the course of chemical reactions in organic chemistry, and
5. Detection of fat-soluble vitamins and drugs in the body fluids.

Silica-gel "G" layers permit the use of even the most aggressive spray agents, heating till charring of certain substances, and the rendering visible of colourless substances by U/V light without fluorescence of the adsorbent.

Thin-layer chromatographic equipment is already in use in universities, pharmacological and medical research institutes and industrial laboratories throughout the world. Details are available from Camlab (Glass) Ltd.

▶MIDGET IMPRINTER

The *Series 700 Rolaprinter* attachment is a flexographic imprinter for web-fed wrapping machines and is made in this country under licence by Mark-o-Print Ltd. It is fully automatic and occupies less than 1 cu. ft. and weighs less than 5 lb. The enclosed inking system assures instant drying of imprints; the ink does not dry on the fountain or on rollers. It uses inks of any colour and the integral impression control prints any changeable legend from code dating to entire copy, on wrappers and bags of treated polythene, cellophane, glassine, waxed paper, aluminium foil, etc.

The printing area can be as large as 4 in. × 3 in. and accurate registration is accomplished using a solenoid micro-switch arrangement. The printer is positively driven from the parent packing machine to ensure exact spotting. Re-positioning for any cut-off change is possible by re-locating the micro-switch. For imprinting continuous or unregistered legends the unit is supplied without micro-switch or solenoid. It fits all standard automatic wrapping, bundling and bag-making machines, and mounting parts suitable for any make of machine are available.

Other features are the visible ink supply with automatic feed; a constant level fountain prevents flooding. An interchangeable die-wheel can be replaced in seconds, while the patented Matelok rings simplify type changing. The interchangeable die-wheel permits rapid changeover and enables one to set up type and dies in advance on a spare die-wheel.

Another characteristic is the Rolaplate sleeve for frequently used legends containing considerable copy and/or trade mark designs. Sleeves are interchangeable and dies of complete copy are permanently fixed on them. They are slipped on and off the die-wheel as desired and can be used in conjunction with the Matelok rings.

▶FILLING AND CAPPING

The *Autopack* high-speed capping machine designed for disc sealing antibiotic vials was announced some 18 months ago and hitherto has been offered as a fully automatic capping machine only and capable of speeds up to 200/min.

The new Type 120 incorporates liquid filling and is capable of filling and capping at speeds of up to 100/min. The range of vials is from 1-30 cc. An important feature of this new unit is its ability to fill at very high speeds without drip. *Perspex* covering built on stainless steel framework is offered where aseptic filling is to be carried out.

For more information about the plant and equipment described please use the coupon on page 196

Book Reviews

The Chemistry and Technology of Fertilisers

Edited by V. Sauchelli. Reinhold Publishing Corpn. Pp. 692. $18.

In the past decade there has been a remarkable increase in the production of fertilisers throughout the world and notable advances in technology of manufacture have been made. The introduction of new formulations and processes has confronted the manufacturer with a host of new problems and a detailed review of the whole field of fertiliser technology is therefore particularly welcome at the present time. This volume, No. 148 in the American Chemical Society Series of Monographs, is a complete up-to-date survey of the chemical fertiliser industry. It is, indeed, a book which progressive manufacturers of chemical fertilisers throughout the world can ill afford to be without.

The first section of the book deals with nitrogen and covers in a remarkably concise manner the conversion of ammonia to nitric acid, ammonium nitrate, ammonium sulphate, urea and urea-formaldehyde products. Numerous line diagrams illustrate very clearly the various processes and equipment described. The more important physical and chemical properties of the various products, together with plant operating data, are given and all important references are listed. As most of the techniques used in Europe as well as America are reviewed, it is somewhat surprising to see no mention of the gypsum or anhydrite process for the manufacture of ammonium sulphate.

The section concerned with phosphorus covers some 300 pages and all aspects of the subject receive generous and exhaustive treatment. Not only are all known processes for converting phosphate rock into phosphatic fertilisers critically surveyed, but attention is also given to the geology, mining, handling and storage of phosphate rock. One chapter deals specifically with granulation processes for mixed fertilisers, while others cover phosphoric acid, ordinary and triple superphosphate, ammonium phosphate, nitro-phosphates and thermal processes.

In addition to a comprehensive chapter on potash, other more general aspects of fertiliser technology which receive attention include problems of caking, drying and cooling, corrosion, and effluent disposal. Liquid fertilisers and minor elements are also reviewed.

In a book of this type, to which some 20 different authors have contributed, it is difficult to maintain a uniformity of standard and treatment of the subject. This has, in fact, been achieved with remarkable success and all the contributions are of a high technical standard, broad in scope and remarkably up to date. Valuable features of the book are the excellent flow diagrams, illustrations and literature references. Minor criticisms concern a number of small printing errors, mostly at the beginning of the book, and the omission of two figures to which reference is made on p. 242.

J. H. Hudson.

Chemical Directory

Annuaire des Produits Chimiques et de la Droguerie. 76th edn. Annuaires Rousset, Paris, 1960. *Pp.* LXXIX+1628+552.

Since the 74th edition was reviewed in our May 1959 issue (p. 217) there has been no change in the style and arrangement of this work and the comments in that review still apply.

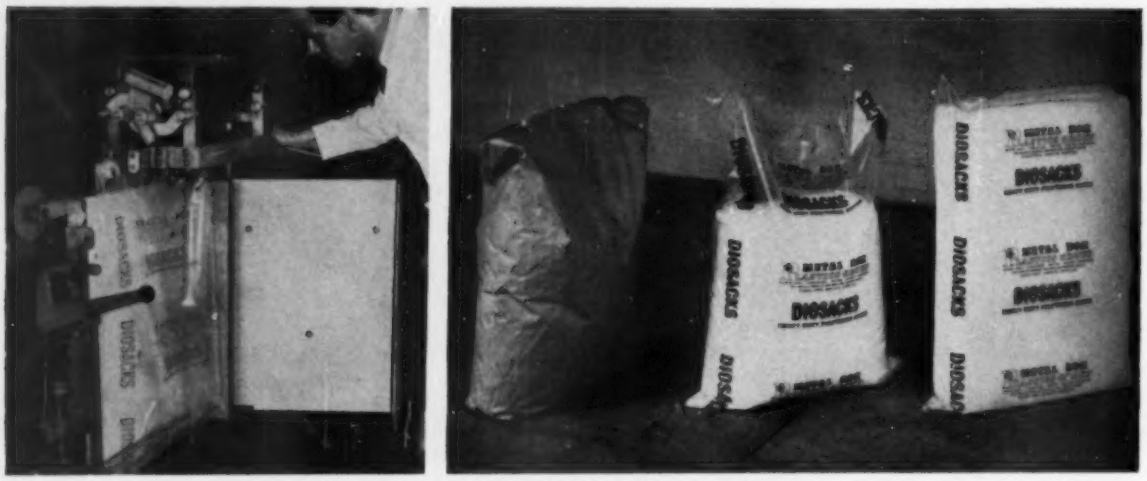
It is a useful work and the nearest thing to an international directory in its field that we know of, covering 18 countries for the manufacture of chemical products and 11 for chemical plant. A work of this sort depends heavily on the co-operation of firms in these countries in filling in questionnaires fully and accurately and returning them promptly. Many British firms do this very badly, even when their interests require it, and doubtless this is true abroad, so the publishers cannot be blamed for every mistake. Many mistakes could however be corrected if the work were checked in proof by at least a British and a German chemist.

The English index to the French headings is idiosyncratic in places but usually comprehensible. Anyone who looks under "Nitric acid" or even "Sulphuric acid" will be disappointed; he must look under "Acids nitric," etc. This should be corrected, like the listing of all alcohols under that word, and similar groupings. "Active coals," "alembics" and "Campeachy wood" (active charcoal, retorts, logwood) are typical gallicisms found. "Form powder" (moulding powder), "Fitch" (pitch) and "Sounds" (some kind of probe?) are meaningless in the context to this reviewer. It is surprising that a number of firms apparently supply the highly unstable radical "Methyl." Nevertheless most headings are either good English or at least comprehensible.

This directory is better for natural materials than for fine and synthetic chemicals. Its headings for plant are insufficiently detailed; *e.g.* for pumps there is only the general heading with four subdivisions. Thirty would barely suffice. Under each heading suppliers are given first for France (by départements) and dependencies, then for other countries alphabetically by the name used in each country.

There are general lists for each country of (1) manufacturers of chemicals, etc., (2) manufacturers of plant, (3) export-import firms (in 16 countries), (4) dealers in chemicals, drugs, etc. (nine countries), and also a list of French retail pharmacists.

D. J. Campbell.



Vacuum frame filling by the Metal Box Co. of Diosack heavy gauge polythene sacks. *Left:* **The Diosack held in position by a clamp before the frame door is closed.** *Right:* **Multi-wall paper sack, unvacuumised Diosack and Diosack filled by the vacuum frame method. All three contain the same amount of polymer granules. The latter is an easily handled unit compared with the other three.**

Rigid, stackable sacks

Vacuum frame filling is a method of filling Diosack heavy gauge polythene sacks in a "frame" or mould under vacuum. The result is a completely rigid pack of rectangular shape, which can be stacked and handled more easily.

Polythene sacks have rightly been considered difficult to stack due to the bulging shape of the bag which prevented it from lying together with the others in the stack. However much vibration was used during filling, and no matter how much squeezing of the bag was done whilst sealing, after the sack had been laid flat and shaken about a bit, the contents settled down and the entrapped air formed a bubble-like bulge. It was impossible to stack a second sack on this cushion of air.

The Metal Box Co. have solved the problem with their vacuum frame method. The equipment consists of:

(1) a mould or frame to give shape to the sack;
(2) a vacuum pump to remove air that may cause bubble-like bulges;
(3) heat sealing jaws to close the sack.

The empty sack is placed in the frame which is positioned under the hopper. Compressed air is then blown into the bag, so that it takes the form of the frame. A weighed quantity of granules is then dispensed from the hopper into the pack, while compressed air is still being blown into it. This prevents "build-up" at any point in the pack and permits even distribution within the bag. The frame is then moved on to the vacuumising and sealing stages where a vacuum probe is inserted into the bag, and 8 in. to 10 in. of vacuum drawn. The seal is then effected, the vacuum probe being automatically removed by the closing action of the sealing jaws. The resulting pack is a rigid rectangular block, easily handled and palletable.

At present the speed, using two units in tandem, is six 50 lb. sacks in 5 min. Metal Box aim at developing a high-speed semi-automatic unit capable of filling five 50 lb. sacks/min.

There are tested, factory-made impulse seals at the bottom of the sack. The top of the sack is either left open or impulse sealed along part of its length, leaving a filling orifice.

A sack packed under the most satisfactory range of 8 in.-10 in. mercury vacuum will after three to four months' storage have a vacuum remaining of about 1 in. This is sufficient for normal handling.

Left: The new family size pressure pack that has been designed by Boots for Freece toothpaste. Right: Plastic dispenser made by Universal Metal Products for dispensing Loxene hair cream.

Press-button toothpaste

A new family-size pressure pack has been designed by Boots for their *Freece* toothpaste. The new easy to use container in red, white and blue, has been specially designed to minimise wastage. At 5s. 11d. the pack contains twice the amount of the biggest ordinary tube of *Freece* toothpaste.

Hair cream dispenser

Universal Metal Products Ltd. have developed a plastic dispenser to dispense Loxene hair cream. The pack, which works with a plunger action, is an interesting moulding because it combines thermoplastic with thermosetting materials, so that both injection and compression moulding techniques have been used. The body, stem, top and end plug are made from white polystyrene and the base from white paper-filled urea formaldehyde.

Foil-packed sutures

The packaging of surgical sutures in foil referred to in the article by L. W. Swann in our February issue, page 85, is covered by Patent No. 861,090 owned by Ethicon Incorporated.

Cheaper hydrogen—I.C.I. to spend £6 million on Billingham process

I.C.I. has decided to spend more than £6 million on modernising a large section of its Billingham factory during the next two years.

Billingham has developed a highly efficient process for making at a lower cost the hydrogen which is the first stage in the manufacture of ammonia, fertilisers and many of the other products of the Division.

This process will use light oil as a raw material in place of the coke which is the present main basis of making hydrogen. The factory's own coke ovens, now nearing the end of their useful life and currently using about 600,000 tons of coking coal annually, will be shut down at the end of this year. Until the new gas-making plants come into operation the coke required will be bought from the National Coal Board.

As a result of this process development the Company expects to be able to continue its policy of reducing its home market prices for nitrogen products, including fertilisers, provided that no other major increase occurs in any of the other cost factors.

The new process will require a smaller labour force than is at present employed in the gas-making section of the factory and steps are already being taken to avoid employees becoming redundant.

Preliminary site work has started and the new plants will come into use in 1963. Full production of all Billingham products will be maintained while the new plants are being commissioned.

Big profits rise. The news about Billingham coincided with the declaration of record I.C.I. turnover—£558 million (against £509 m.)—and group profits—£47·5 m. after tax (against £41·5 m.)—for the year ended December 31, 1960. Final dividend will be 1s. 6d. making 2s. 9d. (2s. 3d.) for the year. I.C.I. exports rose £9 million to £96·6 million during 1960.

New guidance on N.H.S. prescribing

A doctor who prescribes preparations other than those recommended by the Cohen Committee may have to justify his action if the cost of his prescribing is being formally investigated. This was announced in the Commons by the Minister of Health last month. The Minister said:

"The Committee advises that, while there should continue to be no absolute restriction on the prescribing of any drug which the doctor considers necessary for the treatment of his patient, he need not normally go outside the drugs and preparations described from time to time in the British Pharmacopœia, the British Pharmaceutical Codex and the British National Formulary, together with the drugs that the Committee classify as N (new drugs of proved value not yet standard), and P (drugs for which there is prima facie evidence of therapeutic value but where the Committee want further evidence before firm classification).

"The Report will be published and, in consultation with the medical profession, will be brought to the attention of all doctors."

Effect on drug industry. "I am aware that the pharmaceutical industry may be apprehensive of the effect of this advice on its future progress and development; but we are sure that any such apprehension would be ill founded. Many standard preparations are, and will no doubt continue to be, available only in proprietary form, or cost little more or no more in proprietary than in unbranded form. This, together with categories N and P, and the individual doctor's professional discretion, will continue to provide full scope for the products of the industry's research and development to find their reward."

Monsanto to build fumaric acid plant

A fumaric acid plant with a capacity of 5 million lb. a year is to be built at the Newport, Mon., factory of Monsanto Chemicals Ltd. It will be completed in 1962, when it will replace interim manufacturing facilities.

Fumaric acid is derived from maleic anhydride, also made at Newport, where the company's new £1m. maleic anhydride plant recently completed by the Scientific Design Co. Inc. of New York has been brought on stream. The new fumaric acid capacity will be a logical supplement to the 15 million lb. a year capacity of the maleic anhydride plant.

Fisons invest £1m. in U.S. firms

Fisons has acquired a shareholding in the Spencer Chemical Co. of Kansas City, Missouri, one of the main U.S. producers of nitrogenous fertilisers and a large producer of polythene.

At a cost of rather over £1 million 90,000 shares have been acquired. A block of 75,000 shares were bought from the estate of the late Kenneth A. Spencer, and a further 15,000 from other sources. Spencer Chemical Co. has 2·72 million shares issued, and these were recently quoted on the New York Stock Exchange at $35.

Textile and farm chemicals plants for Russia

Two plants, one to make textile chemicals and the other to make weedkiller, have been ordered from Britain by Techmashimport of Moscow. Together the contracts are worth more than £2 million.

The plants will be built by Wycon Services Ltd., a company jointly set up by Fisons and Constructors John Brown Ltd. The work will be executed by C.J.B., Whiffen and Sons Ltd. (the industrial chemical subsidiary of Fisons) and Fisons Pest Control Ltd.

One plant, based on Whiffen's design, is for the production of dimethylol ethyleneurea. DMEU is used in the manufacture of "drip-dry" fabric and the highly automated plant can produce 12,000 ton/yr. This contract is worth over £¾ million. The other contract, worth £1¼ million, is for a plant to produce 4,200 ton./yr. of MCPA hormone weedkiller. The design of this plant is based on the experience of Fisons Pest Control Ltd.

Pilot plant will speed chemical innovations

To provide better facilities for the rapid manufacture of tonnage batches of its many development products, I.C.I. heavy organic chemicals division is erecting at Billingham, Co. Durham, a general-purpose pilot plant. This is due for completion in late 1962.

Although it will still be necessary to build special pilot plants occasionally, the new plant, together with existing special pilot plants, will be capable of making the majority of chemicals which are planned for development in the next few years. Equipment will be provided for carrying out such reactions as alkylation, amination and condensation over a range of temperatures and pressures, with auxiliary equipment to treat the reaction products by unit operations such as washing, filtration, crystallisation, drying and distillation.

Monsanto sales up again

For the second successive year Monsanto Chemicals Ltd. has created a new record in annual turnover. At £20,761,862 it is £2,334,357 higher than the previous record total achieved last year. Direct exports represented 35% of all sales and were £7,254,551 compared with £6,877,980 last year.

After allowing for depreciation, obsolescence and debenture interest, the net profit for 1960 before taxation was £2,398,668 (£2,265,635). After taxation net profit was £1,416,569 (£1,336,424).

The company's sales of fine chemicals and pharmaceuticals were reasonably satisfactory over the year, although competition in overseas markets, especially in aspirin and salicylates, continued to intensify. There was a high demand for benzoates; the demand for sodium benzoate for automobile antifreeze preparations continued to grow.

Heavy chemical demand remained constant, but the shortage of naphthalene caused the phthalic anhydride plants to be operated below capacity whilst the market remained unsatisfied. Output of maleic anhydride was also insufficient to meet increasing demand, but the Newport plant was only commissioned at the year end.

The Ruabon phenol plant achieved an increase in production efficiency during the year and sales were maintained at the limit of plant capacity. Sales of pentachlorophenol products again expanded, while there was an increase in styrene monomer sales (sold by the company as agents for their associate Forth Chemicals Ltd.).

Aspro-Nicholas expand

Trading results so far this year, says Mr. M. A. Nicholas, chairman of Aspro-Nicholas, have fallen short of expectations in one or two fields. Further, there has been an increase in expenditure involved in preparing the ground for full integration of the Aspro-Nicholas and Griffiths Hughes businesses. The board considers that the dip in profits is temporary and that they are therefore justified in declaring a third quarterly interim dividend of 3½%, the same rate as for the first two quarters of the year.

In the absence of future adverse circumstances, the fourth and final interim dividend is expected to be 3½%.

Two overseas companies have recently been acquired. The French subsidiaries have purchased the business of Laboratoires Vitapointe S.A. throughout the world, excluding Great Britain and Commonwealth countries, for approximately £415,000. The Vitapointe product range includes hair lacquers, hair creams and dyes. In America Nicholas International have acquired a small veterinary company for approximately £30,000.

I.C.I. increase alkylamines capacity

The Heavy Organic Chemicals division of I.C.I. is to increase production of alkylamines at Billingham, Co. Durham. At present there are two plants for making mono-, di- and tri-methylamines, and one plant for mono-, di- and triethylamines, with a combined capacity of between 2,000 and 3,000 tons per year.

A completely new methylamines plant will be built with a capacity more than five times that of the existing unit, which began production in 1952. The new plant, which is due for completion in 1963, will be one of the largest in the world and will use the most advanced manufacturing techniques. It should enable I.C.I. to satisfy the rapidly expanding U.K. market and to increase methylamines exports to most parts of the world.

I.C.I. is also increasing the capacity of the ethylamines plant to well over double the present figure. These extensions should be completed by the end of 1961.

A lot more p.v.c.

I.C.I. are erecting a polyvinyl chloride plant at their Hillhouse works near Blackpool, which will raise their manufacturing capacity of p.v.c. from the present figure of 70-80,000 tons a year to 115,000 tons a year by the beginning of 1963. During the past ten years demand in the U.K. for vinyl materials has expanded nearly ten times to its present level of 110,000 tons a year.

£100,000 gift for medical institute

The Wellcome Trust have granted £100,000 to the University of Otago, New Zealand, to build an Institute of Medical Research in Dunedin. This Institute has been provided so that Prof. Sir Horace Smirk may develop his research interests and establish better facilities for research medicine in New Zealand. The University of Otago have announced the creation of a special Chair of Research Medicine and that Sir Horace Smirk will be the first holder.

Pesticide sales

Distributors of insecticides, fungicides, weedkillers and rodenticides included in the Pharmacy and Poisons Act and the Poisons Rules are reminded that the Association of British Manufacturers of Agricultural Chemicals issued in 1960 a booklet giving the provisions of the Pharmacy and Poisons Act and Rules for the sales of these products. This booklet is still current and is available from the Association, 86 Strand, London, W.C.2, at 3s., cash with order.

I.C.I. division to build new labs.

To keep pace with its rapidly developing manufacturing activities I.C.I. General Chemicals division, centred on Merseyside, is to build new research laboratories at Runcorn Heath.

The division has expanded rapidly in recent years, particularly in the fields of chlorinated solvents, monomers for synthetic fibres and plastics, and organic fluorine products such as the Arctons and Fluothane. Further large increases in both research and technical service efforts are now necessary to match the growing interests of the division at home and in the export market. The additional laboratory accommodation at Runcorn Heath will be on a site adjoining the division's engineering and technical department offices and the future headquarters of the division which is being moved from Liverpool.

The Widnes laboratories, together with the nearby recently completed multi-purpose pilot plant facilities, will be retained and developed as the centre for larger scale research and pilot plant production. The labour required in Widnes for these activities has been expanded recently and will remain unaffected by these changes.

Small-scale laboratory research will be concentrated in the new buildings in Runcorn, the architect for which will be Mr. F. Gibberd, who has designed the buildings already on the site.

Merchants move

Mould and Bishop Ltd., importers and exporters of fine chemicals, have moved their offices to 86A Richmond Road, Kingston-upon-Thames, Surrey (Tel.: KINgston 6547; Cables: CHEMPRO-Kingston-upon-Thames).

Many new chemicals have been added to their range, including some of the newer synthetics. These materials from sources such as EFTA and Common Market countries can be delivered duty paid in the United Kingdom or offered c.i.f. or f.o.b. main world centres.

Pfizer-Diversey agreement

Pfizer Ltd. and its subsidiary Kemball, Bishop and Co. Ltd. have entered into an agreement with Diversey (U.K.) Ltd., under which the latter handles all sales in the U.K. of sodium gluconate or gluconic acid, when required for use in bottle-washing or aluminium etching in the U.K.

Diversey holds patents Nos. 771,791, 771,792 and 731,035 covering the use of sodium gluconate or gluconic acid in these fields. Pfizer Ltd. wishes to state that it neither recognises nor contests the validity of these patents.

Agency appointment

Evans Medical Ltd., Liverpool, have appointed Evans, Gadd and Co. Ltd. of Exeter to be their agents for Cornwall, Devon and West Somerset.

Sir John Carmichael has been appointed to the board of Fisons Ltd. Sir John, who is 50, was under-secretary to the Sudan Ministry of Finance and Economics from 1954 when the State became self-governing. From 1956 to 1959 he was financial and economic adviser to the Sudan Government. In March 1960 he was appointed chairman of Fisons Pest Control's Sudan subsidiary company and later in that year he became a director of Fisons Pest Control Ltd. in the U.K. He is deputy chairman of the Independent Television Authority, and a member of the Scottish Gas Board.

F. G. Pentecost, chairman of A. Boake, Roberts and Co. (Holding) Ltd. and its main subsidiary A. Boake, Roberts and Co. Ltd., has retired. He retains his directorship of Albright and Wilson Ltd. He joined the company as a junior in 1904 and recognition of his outstanding ability was made in 1926 when he was elected a director. He was appointed managing director in 1943, and became chairman in 1952. Mr. Pentecost has made a host of friends in industry, and has been a prominent member of numerous trade committees and associations. He served on the council of the Association of British Chemical Manufacturers and until quite recently he was chairman of the British Essence Manufacturers' Association.

He is succeeded as chairman by **B. White,** who also retains his position of managing director of both companies. **W. E. K. Piercy,** a director of Albright and Wilson, has been appointed a director of both the Abrac companies.

Christy and Norris Ltd., Chelmsford, manufacturers of disintegrating, grinding and pulverising equipment and laboratory mills, have appointed two new directors, **F. V. Mills** and **L. Hammond,** who will be responsible for sales and finance respectively.

Mr. Mills served his apprenticeship with the company from 1935-8. Mr. Hammond joined the company in 1950 after appointments with Coalite and Chemical Products Ltd. and the Yorkshire Traction Co. Ltd. He was appointed company secretary in 1954.

H. W. Vernon, technical director of W. J. Bush & Co. Ltd. has retired after 45 years with the company. He is 65. He will continue with the company as a consultant. Mr. Vernon graduated at Manchester University and joined W. J. Bush as research chemist. For five years the research department of the company was at the Dyson-Perrins Laboratory of the University of Oxford. When research was moved to the Hackney headquarters of the company, he became chief research chemist, was then in charge of research and development and became chemical superintendent before his promotion to the board as technical director. He is succeeded as technical director by **J. F. G. Wynne.** Mr. Wynne also graduated at Manchester University. He joined the company in 1923 at the Widnes works, of which in recent years he has been manager and chief chemist.

J. F. G. Wynne

The Pyrethrum Board of Kenya has appointed **Donald Maciver** to work as a research chemist at its laboratories in Nakuru, Kenya.

Mr. Maciver is an Associate of the Heriot-Watt College, Edinburgh, and of the Royal Institute of Chemistry.

A presentation, delayed because of ill health, was recently made to **A. C. McDougall,** who retired in October last year as chief pharmacist at the Wellcome Chemical Works, Dartford. Gifts from colleagues were made to him at his home by **F. G. Rundall,** general works manager. Mr. McDougall joined Wellcome in 1924. After working in the experimental laboratory of the Wellcome Chemical Works he was appointed head of the pharmaceutical development laboratory. He became widely recognised as an expert on injection solutions, and was made a member of the Sterile Materials Sub-committee of the British Pharmacopœia Commission.

Philip V. Colebrook, 36, managing director of Pfizer Ltd., has been appointed chairman of the board of directors of all companies within the Pfizer Group.

He replaces **Richard C. Fenton,** who has been appointed an operations vice-president of Pfizer International, with H.Q. in New York and with responsibility for the company's operations in Europe, the Middle East, Africa and Canada. Mr. Colebrook joined Pfizer in 1952 as works and production manager. He became one of the youngest directors of the Pfizer organisation in 1956 at the age of 32, when he was elected to the board of Pfizer Ltd.

Mr. Colebrook, a native of Andover, Hampshire, is an Associate Member of the Institution of Chemical Engineers. Before joining industry he did post-graduate work in chemical engineering at the Battersea Polytechnic. During the war he was commissioned in the Fleet Air Arm. Married with four children, he lives at Salisbury Road, St. Margaret's Bay, Kent.

Denys S. Asbury has been appointed assistant secretary to the Laporte Group of Companies.

R. T. Dobson has resigned as director and executive in charge of production and technical matters with Chesebrough-Pond's Ltd. He joined the board of the company in 1948 after acting as a consultant to the company since 1936. Mr. Dobson, who is 54, decided to avail himself of the company's early retirement provisions, and is now free to accept consultant work or an executive position in industry. Mr. Dobson was president of the Society of Cosmetic Chemists in 1955-57.

I. V. L. Fergusson, chairman and managing director of Evans Medical Ltd., has been appointed to the board of Glaxo Laboratories Ltd. Evans became part of the Glaxo group earlier this year.

Dr. M. C. L. Cox has been appointed director of public relations to all companies within the Pfizer Group. He has been with the company for about two years. Married with two children, he lives at Folkestone.

D. C. M. Salt has been made a director of Monsanto Chemicals Ltd. Mr. Salt joined Monsanto in 1935. He has been director of sales since 1959.

W. J. Lloyd has been appointed chairman of William R. Warner and Co. Ltd. and associate companies, Richard Hudnut Ltd. and Lambert Chemical Co. Ltd. **L. Coombs** has been appointed managing director of the group. He was formerly director in charge of U.K. operations for Aspro-Nicholas Ltd., and later managing director of Mead Johnson Ltd. He is 40.

J. R. Morris, managing director of Izal (Overseas), Ltd. undertook on March 20 an extensive overseas tour of the U.S.A., Australia, New Zealand and South, Central and East Africa. Mr. Morris hopes to develop the sales of Izal and Ronuk products, whether by direct export, licensing agreements or the formation of subsidiary companies.

Thomas Morson and Son Ltd. have appointed **A. Fraser,** Northern representative in succession to **Graham Adams** who is retiring after 20 years' service.

New list of approved names for drugs

The British Pharmacopœia Commission has issued the following new list of approved names:

Approved name	*Other names*
BENZILONIUM BROMIDE	
3 - Benziloyloxy - 1 : 1 - diethylpyrrolidinium bromide	
	Portyn
CETOXIME	
N-Benzylanilinoacetamidoxime	
Febramine is the hydrochloride	
CYCLOPENTOLATE	
2 - Dimethylaminoethyl α - 1 - hydroxy*cyclo*pentyl-α-phenylacetate	
	Mydrilate
EPIOESTRIOL	
Oestra-1 : 3 : 5(10)-triene-3 : 16β : 17β-triol-16-*epi*-Oestriol	
	Actriol
ERYTHROMYCIN ESTOLATE	
Erythromycin propionyl ester lauryl sulphate	
	Ilosone
ETHYL DIBUNATE	
Ethyl 2 : 6 - di - *tert* - butylnaphthalenesulphonate	
ETHYLOESTRENOL	
17α-Ethyloestr-4-en-17β-ol	
FLUPHENAZINE	
10-{3 - [4 - (2 - Hydroxyethyl) - 1 - piperazinyl]-propyl-}2-trifluoromethylphenothiazine	
Moditen is the dihydrochloride; Prolixin is the dihydrochloride	
ISOBUZOLE	
5 - *iso*Butyl - 2 - *p* - methoxybenzenesulphonamido-1 : 3 : 4-thiadiazole	
	Stabinol
METHOHEXITONE	
α - (±) - 5 - Allyl - 1 - methyl - 5 - (1 - methylpent-2-ynyl)barbituric acid	
	Brevital; Brietal
METHOSERPIDINE	
10-Methoxydeserpidine	
	Decaserpyl
OXYPHENBUTAZONE	
4 - *n* - Butyl - 2 - *p* - hydroxyphenyl - 1 - phenylpyrazolidine-3 : 5-dione	
	Tanderil
PHENAMPROMIDE	
N-(1-Methyl-2-piperidinoethyl)propionanilide	
PRENYLAMINE	
N-(3 : 3-Diphenylpropyl)-α-methylphenethylamine	
	Segontin
PROLINTANE	
1-(α-*n*-Propylphenethyl)pyrrolidine	
1-Phenyl-2-pyrrolidinopentane	
PROPIOMAZINE	
10 - (2 - Dimethylaminopropyl) - 2 - propionylphenothiazine	
	Dorevane; Largon
SODIUM DIBUNATE	
Sodium 2 : 6-di-*tert*.-butylnaphthalenesulphonate	
	Becantyl
SULPHAUREA	
p-Aminobenzenesulphonylurea	
	Euvernil
TOLPENTAMIDE	
*N-cyclo*Pentyl-*N'*-toluene-*p*-sulphonylurea	

INDEX TO THE SUPPLEMENTARY LIST

Proprietary Name	*Approved Name*
Actriol	Epioestriol
Becantyl	Sodium Dibunate
Brevital	Methohexitone
Brietal	Methohexitone
Decaserpyl	Methoserpidine
Dorevane	Propiomazine
Euvernil	Sulphaurea
Febramine	Cetoxime
Ilosone	Erythromycin Estolate
Largon	Propiomazine
Mydrilate	Cyclopentolate
Moditen	Fluphenazine
Portyn	Benzilonium Bromide
Prolixin	Fluphenazine
Segontin	Prenylamine
Stabinol	Isobuzole
Tanderil	Oxyphenbutazone

Communications about approved names should be addressed to the Secretary, B.P. Commission, General Medical Council Office, 44 Hallam Street, London, W.1.

British Glues move

The London offices of British Glues and Chemicals Ltd. have been transferred from Imperial House, Kingsway, to Berkshire House, 168-173 High Holborn, London, W.C.1. Telephone number remains TEMple Bar 7777.

Duty re-imposed on nine chemicals

A new Treasury order revokes the temporary exemption from import duty of the following chemicals:

1 : 1-Dimethoxy-2-phenylethane
n-Decaldehyde
2-Methyl-*n*-undecaldehyde
n-Nonaldehyde
n-Octaldehyde
n-Undecaldehyde
Undec-10-enaldehyde
γ-Undecolactone

The Order further amends the Import Duties (Temporary Exemptions) (No 10) Order, 1960, by revoking, with effect from April 1, the temporary exemption of cyclohexanone. The Order came into operation on the March 1 and has been published as Statutory Instruments 1961, No. 280.

P.D.'s Crewe depot

A new distribution depot has been opened at Weston Road, Crewe, by Parke Davis of Hounslow.

Mr. Leslie O. Smith, general manager, said that the new depot would service a large part of the north of England and north Midlands, providing a more streamlined handling of medical supplies in those areas, previously dealt with from Hounslow. Direct road services will be provided to major centres in the area.

The depot comprises a warehouse, with floor area of 11,062 sq. ft. and an office block. Manager is Mr. J. R. Watkis.

Polychol not Etolan

Croda Ltd., who recently offered their range of ethylene oxide derivatives of lanolin alcohols under the name of *Etolan*, have been advised by the Robinson-Wagner Co. of New York that this name constitutes an infringement of their trade mark *Etholan*. The name *Etolan* has therefore been withdrawn and the surface-active agents will now be known under the name *Polychol*.

Dangerous Drugs amendments

By Regulations 2, 6 and 7 of the Dangerous Drugs Regulations, 1961, and the Schedule thereto the drugs acetyldihydrocodeine and propoxyphene cease to be subject to the control imposed by Part II of the Dangerous Drugs Regulations, 1953, and are instead made subject to the control imposed by Part III of those Regulations, which is less strict, in that the control of sale and distribution applies only in the case of wholesale dealers, and in that there is no restriction on possession of a drug in a quantity not exceeding one pound. There is no change in the control over the other drugs named in the new Fifth Schedule. Regulations 1, 3 and 5 make drafting changes consequential on the foregoing. By Regulation 4 an agent acting in the transfer of a business and its stock-in-trade will not, merely because the stock includes drugs controlled under the Regulations, require a licence under the Regulations on the ground that he is procuring or offering to procure the drug for another person.

Posting perishable biological material

New regulations have been laid down by the Universal Postal Union in cooperation with WHO for the posting of perishable biological material. Such material may be sent by letter post and only between officially recognised laboratories.

Materials containing live pathogenic micro-organisms must be sealed in flasks or ampoules of thick glass. Material that does not contain live pathogenic micro-organisms must be packed in a waterproof container. Both types of package should be padded with absorbent material and securely sealed in an outer container. This again must be placed in a further protective container so that it is not loose. A violet label with a special symbol is used for addressing the package. This label also has on it certain precautionary notices.

3,500 gal. at a time. *The latest tanker to join the fleet of Croda Ltd. Its capacity is 3,500 gal. The growing use of bulk storage for many types of liquid fatty chemicals and industrial oils necessitates an increasing use of bulk shipments.*

CHEMICAL EXPRESS

A fleet of 19 of I.C.I.'s newest rail tank wagons, containing altogether 300 tons of iso-octanol, recently formed a special train from the works of their Heavy Organic Chemicals Division at Billingham. Destined in the first place for King George V Dock, London, this plasticiser alcohol was shipped on the s.s. *Afric* to I.C.I. of Australia and New Zealand, Melbourne. The conveyance of this chemical in bulk by rail enables a quicker and more efficient service to be given and this special shipment by rail follows co-operation between I.C.I., British Railways (North Eastern Region) and the shippers. The new rail tank wagons are all fitted with the continuous vacuum brake so that the special trains, of which this was the first of a series, may travel at express speeds.

Detergent dumping?

The Board of Trade are considering an application for the imposition of an anti-dumping duty on alkyl (dodecyl) benzene detergent alkylate imported from Italy.

Enquiries should go to: Tariff and Import Policy Division, Room 3136, Horse Guards Avenue, London, S.W.1.

Call for metric system for Britain

The pharmaceutical industry is cited as a leading user of metric weights in a new P.E.P. booklet, "Systems of Measurement," which strongly recommends that Britain change to decimal money and the metric system. There has been a landslide towards decimalisation in Commonwealth countries, the booklet points out and warns that in a few years Britain will be out of step numerologically with the rest of the world. A change in our system of measurement seems inevitable. "The question at issue is whether we choose to change by an act of corporate will or are content to be pushed.

"In this matter of units, time is not on our side. Where decimalisation of the coinage is concerned the longer the delay the greater will be the expense. Where weights and measures are concerned the longer the delay the greater the confusion to be ultimately disentangled and the heavier the handicaps to exports, particularly of high conversion value goods, such as precision engineering measuring instruments and machine tools.

"It would seem important to make the one change that can be guaranteed to involve no subsequent changes, that is to the metric system. The metric system means one thing and one thing only; it is precisely defined and already in world-wide use, and would be a step towards standardisation where standardisation can only be an advantage."

The booklet costs 3s. post free from P.E.P., 16 Queen Anne's Gate, London, S.W.1.

Welsh industry's own journal

A new monthly journal covering finance and industry in Wales has been published with the name *The Voice of Welsh Industry*. The first issue, dated March, contains contributions and messages from leading Welsh industrialists and articles on subjects as varied as radioisotopes and the prospects for steel. Other articles deal with industrial architecture, banking, American investment in Welsh industry, new inventions, the D.S.I.R. technical information service, dry docks, shipping, coal and fisheries. The journal is well supported by advertisers whose announcements are classified in an industrial directory section.

The *Voice of Welsh Industry* impressively reflects the vigour of industrial Wales. It costs 1s. 6d. or 20s. a year, including postage. Copies can be obtained from South Wales Voice Newspapers, Ystalyfera, Swansea, Glamorgan.

Public relations monthly

Pr-Practice is a new monthly journal for public relations practitioners both in the U.K. and in Europe. Published in Switzerland by John Anns at 2 Avenue de la Rasside, Lausanne, and edited in London by Andrew Bainbridge, it will be sold on subscription only at £2 10s. p.a. The first issue appeared on March 5.

"Ludicrous" name change

The action of G. D. Searle and Co., in marketing *Enavid* under the name *Conovid* as an anti-fertility drug, is criticised by Prof. A. G. Macgregor of Aberdeen University in a letter in the *Lancet*. Enavid (norethynodrel) has been marketed for some time for the treatment of uterine bleeding. Conovid is the same drug but in 5 mg. instead of 10 mg. tablets. "For a firm to multiply its own proprietary names according to the therapeutic applications, or dose strength, of that product, is ludicrous," says Prof. Macgregor.

Price's sell new fat-based chemicals

Price's (Bromborough) Ltd. have been appointed sole agents and distributors in the U.K. by Unilever-Emery N.V. They will handle the oleochemical products obtained from the Dimerisation and Ozonisation processes operated by Unilever-Emery in Holland.

Unilever-Emery N.V. was founded in 1959 as a joint venture by Unilever N.V., Rotterdam, and Emery Industries Inc. of Cincinnati. They have erected a new factory for producing fat-derived chemicals not previously manufactured in Europe.

The first group of products now on stream is the Dimer Acids which will be marketed by Price's under Emery's "Empol" trade mark. These Dimer Acids are of interest for the production of polyamides (useful for thixotropic paints, paper coatings, adhesives and sealing compounds), rigid and flexible polyurethane foams and coatings, hydraulic fluids, insecticides, corrosion inhibitors, etc.

Also available will be the products of the Emery ozonisation plant. Azelaic Acid (*Emerox* 1110) is used for making polyamides, alkyd resins and polyurethanes, di-alkyl azelates and polyesters as low temperature P.V.C. plasticisers, and esters for synthetic lubricating oils and greases. Pelargonic Acid (*Emfac* 1202) is principally of value in the production of alkyd resins.

Agency offer

The governing director of a New Zealand firm of manufacturing chemists is visiting London in early May. He wishes to arrange the manufacture and sale of his range of skin care products in the U.K. The products have been sold in New Zealand for eight years and the market has now extended to Australia. He may be written to c/o The Editor, MANUFACTURING CHEMIST, 9 Eden Street, London, N.W.1.

Mixture too strong?

A City firm which wrote to an Irish chemical company with an address in Distillery Lane, Dundalk, has had the letter returned by the Post Office.

Across the envelope was written: "Firm dissolved." (*From the Daily Telegraph.*)

DHA Suntans "satisfactory" says consumers' association

Nine artificial suntan lotions (liquids and creams) were investigated by the Consumers' Association, ranging in price from 1s. 11d. to 5s. 2d. per fluid ounce and made in France, in Spain, in Canada, in the U.S.A., and in Britain. Originally the report was due to appear in a summer issue of *Which?*, when in fact there was only one such preparation on the market, but the number of artificial suntan preparations available kept increasing so that the report had to be held up to cover the preparations now available.

Which? says that the active ingredient in these preparations, dihydroxyacetone (DHA), is not a dye or a stain but a staining agent that induces a chemical reaction on the skin, which shows up as artificial tan colour.

Apart from carrying out chemical analyses, the co-operation of user testers was obtained. Several users found that some of the artificial suntan preparations tended to come out patchy or streaky, or that the colour obtained was unnatural, or that the preparations produced unwanted stain on the skin or clothing. On the whole, however, *Which?* concludes that the preparations can produce a tanned appearance on some people's skin and suggests that, as a rule, the cream preparations result in a more even colour than the liquids. CA also believes that there is no medical reason for most people to fear an occasional use of an artificial suntan preparation for limited periods. However, they warn most emphatically that the colour produced that so resembles suntan is not the real thing and therefore no protection against sunburn. Three of the preparations tested (*Positan*, *Tanfastic* and *Night Tan Sunscreen*) incorporate a screening agent, and were found effective as a sunscreen; three other preparations warn the users that they should not be used as protection against sunburn; the other three give no such warning. Five of the preparations tested gave no indication of the volume of the contents on the label and none showed the amount of DHA present in the preparation.

Which? considers *Tanfastic* (3s. 6d.), which contains the greatest amount of DHA, as the best buy among the preparations tested—but with the qualification that, as all the other tanning lotions, it would only produce a "pseudo-tan."

Materials handling conference

The second international conference organised by the Institute of Materials Handling is to be held at Southport on May 10-12. Of interest to the chemical industry are two lectures, "Building Construction in the Chemical Industry," by a speaker from I.C.I., and "Bulk Handling of Powders," by F. E. D'Arcy-Smith, managing director of Polysius Ltd.

Toilet goods sales increase

There was little difference in the number of enterprises manufacturing toilet preparations in 1958 compared with 1954. According to the latest census of production there were 59 enterprises in 1958 (against 57 in 1954) which employed 25 or more people and 20 of them employed less than 50 people. Sales by the 59 establishments had, in 1958, risen to £45 million (£30·4 million in 1954) of which hair preparations at £13·4 million (£10·2 million) accounted for almost one-third. Sales of perfumes are recorded at £4·1 million (£3·2 million); face powders, £1·3 million (£1·6 million), talcum powders, £4·1 million (£2·8 million), and lipsticks, £2·4 million (£1·5 million). Toothpaste sales rose to £5·3 million (£3·3 million).

Sewage conference

The annual conference of the Institute of Sewage Purification will be held at Brighton from June 19-23. It will mark the 60th anniversary of the founding of the Institute.

One of the papers will be given by Prof. F. H. Garner, Director, Chemical Engineering Department, The University of Birmingham. He will discuss "Chemical Engineering in Water Pollution."

Micro- and semi-microchemical methods

Commencing on April 22, a course of 12 lectures and appropriate practical work will be held on Saturday mornings at the Norwood Technical College, London, S.E.27, from 9.15 a.m. to 12.30 p.m.

Application forms for admittance to the course may be obtained from the Secretary of the College. The London fee for the course is £1.

Corday-Morgan medal

The Chemical Society has awarded the Corday-Morgan Medal and Prize to Dr. A. R. Battersby, lecturer in chemistry at the University of Bristol, for his outstanding work on the stereo-chemistry of emetine and its congeners and also his contributions to the chemistry of curare alkaloids and the biogenesis of papaverine.

THE CHEMICAL MARKET

This Month's Changes

LONDON.—Prices are still steady and no outstanding changes have occurred this month.

Lithium carbonate B.P.C. in 5 cwt. lots is down 11d. to 5s. 1d. oz. **Sulphathiazole** in 12¼ kg. lots has dropped 5s. 3d. to 34s. 6d. kg. **Palm kernel oil** (refined, deodorised, 2 ton lots, naked ex-works) has dropped £4 to £115 ton. The only rise is **methyl salicylate** in 1 cwt. lots which is up 2d. to 3s. 5d. lb.

Cheaper air freight for drugs

Drugs and medicines imported from the United States will benefit from new rates to be introduced by B.O.A.C. for cargo flown between the U.S.A. and the U.K.

The rates for chemicals, drugs, pharmaceuticals and medicines, will be introduced, subject to the approval of the governments concerned, if no new rate agreement is reached by members of the International Air Transport Association before April 10.

At present, the cost for consignments from New York to London, Manchester or Glasgow is 8s. 8d. (121 cents) a kg. for 45 kg. and over. The new rate will be 6s. 6d. (91 cents) a kg. for 45 kg. and over.

Food science

The 1st International Congress of Food Science and Technology will be held in London from September 18-21, 1962. Lord Rank will be president of the congress.

The executive committee under the chairmanship of Dr. H. D. Kay, is: Dr. A. J. Amos (chairman of publicity committee), Dr. E. C. Bate-Smith (chairman of scientific programmes committee), Mr. A. P. Buchanan (chairman of transport and visits committee), Dr. J. B. M. Coppock, Mr. F. J. Monkhouse (chairman of finance committee), Dr. J. D. Mounfield, Lt-Col. F. J. Griffin (honorary secretary).

The meetings will be held at the Imperial College of Science and Technology and the papers will cover the following fields:

- chemical and physical aspects of food and food processing;
- biological and microbiological aspects of food and food processing;
- texture, flavour, colour, keeping properties and other aspects of quality; quality control;
- processing, packaging and distribution;
- education;
- food and health.

During the Congress visits will be paid to food factories, universities, Government and industrial laboratories, and the social events will include a reception and a banquet. Speakers and participants will come from many countries.

Enquiries should be addressed to: The Hon. Secretary, 1st International Congress of Food Science and Technology, 14 Belgrave Square, London, S.W.1.

Aerosol association formed

The British Aerosol Manufacturers' Association—a new association—will be affiliated to the Association of British Chemical Manufacturers.

The H.Q. of the association are at Cecil Chambers, 86 Strand, London, W.C.2, and the secretary is W. A. Williams.

Cosmetic chemists strongly support annual dinner

More than 260 members and their guests—a record—attended the annual dinner and dance of the Society of Cosmetic Chemists of Great Britain in London.

The president of the Society, Dr. H. W. Hibbott, proposed " The Guests " in a witty speech which was well received.

Mr. Hardy Amies, fashion designer, replied for the guests. He referred to an American book " The Importance of Wearing Clothes " in which the author concluded that people who were better clothed were more civilised. He thought that cosmetics (with which he had recently become associated) played a part in this.

A highly successful evening ended with dancing and a cabaret.

Hair and beauty—Toni Co.'s filmstrip

The Toni Co. has sponsored a new educational filmstrip called " Hair, Health and Beauty." It is intended for use in schools and it explains quite simply facts about the structure of the hair, care of the hair and hair styling. Teaching notes are supplied with the filmstrip, which is in colour.

Mr. J. E. N. Peters, director and general manager of the Toni Co., states that his organisation is spending about half a million pounds a year on research to provide products that help women to make the best of themselves. The filmstrip is quite objective and simply makes girls conscious of hair health and beauty. It is intended for girls of 13 upwards. It was made with advice from the National Committee for Visual Aids in Education.

Scots forum for chemical engineers

The president of the Institution of Chemical Engineers Mr. W. K. Hutchison presided at the inauguration of the Scottish branch of the institution in Edinburgh on February 17, when the following Branch Committee was elected:

Chairman of the branch is Mr. T. Flavel and the Hon. Secretary, Dr. D. M. Wilson.

Obituary

J. W. Urban, director of Monsanto Chemicals Ltd. since 1954, died in Bombay recently after a short illness. He had been visiting India on official business connected with Monsanto Chemicals of India Private Ltd., of which he was managing director.

Mr. Urban joined the sales department of Monsanto in 1929. He left the company in 1940 to enter the safety glass industry and subsequently served with H.M. Forces before rejoining Monsanto in 1945. He was particularly concerned, in his later years, with the company's overseas activities.

THE TECHNICAL PRESS IN APRIL

Corrosion Prevention Becomes International

A FULL report of the 1st International Congress on Metallic Corrosion held in London on April 10-15 is published in **Corrosion Technology.** A further report of this important event is to be included in the May issue. Condensations of all the papers presented are published.

Chemical and Process Engineering includes a special feature on safety consisting of three articles: " Safety in the Chemical Industry," " Explosion Hazards " and " Safety in the Nuclear Industry." The series on constructional materials for chemical plant continues with a description of the uses of reinforced plastics.

Fibres and Plastics reviews polyester resins with special reference to their uses in reinforced plastics. Other articles include " Analysis and Testing of Plastics," " Structural Aspects of Bonding in Papermaking " and " Low Temperature Radiant Heat Drying."

Corrosion prevention in the oil industry is discussed in two articles in **Petroleum;** one deals with the extension of storage tank life through design and treatment and the other is a general review of corrosion techniques and services. Other articles include " The Status of Geochemical Prospecting " and " Fire Precautions at a Middle East Oil Terminal."

Polishes are dealt with in two articles in **Paint Manufacture:** " Self-shining Emulsion Polishes " and " Modern Floor Polishes." An interesting report is also published dealing with some of the factors that effect the gloss of emulsion paints.

Of interest to plant operators is " Process Control by Computer " which appears in **Automation Progress.** In the analytical field there is an article entitled " X-Ray Methods of Automatic Analysis." Other reports include " Developments in Cybernetics " and " Hydraulic Servomechanisms."

Irrigation and water conservation are the main topics of **World Crops.** Articles in this review include a report of the Cambridge Irrigation Conference, " Sprinkler Irrigation in the U.S.A.," " Development Survey in Tripolitania " and " Cotton and Water Use in Israel."

Articles in **Dairy Engineering** include " A New Durable Floor for Dairies," " Maintenance Which Can Prevent Breakdowns—Heat Exchange Plate Rubbers " and a report of the Scottish Dairy Show.

The factory visit report in **Food Manufacture** is on Smedley's pie-making factory at Faversham. There are also reviews of the dairy industry, canning and freezing, and jams and preserves.

Specimen copies of the journals containing these articles can be obtained from the Circulation Manager, Leonard Hill Ltd., 9 Eden St., London, N.W.1.

Company finance

Monsanto Chemicals Ltd. A second interim ordinary dividend of 6d. per 5s. share (10%) less income tax, making the total dividend 9d. per share (15%) (same), has been declared.

Results for 1960 were:

	1960	*1959*
Net sales	£20,761,862	*£18,427,505*
Net income after tax	£1,416,569	*£1,336,424*

Sir Miles Thomas, the chairman, said: " We increased our turnover, but the recession in durable consumer goods induced by the credit squeeze had its inevitable effect, particularly in plastics and our range of products for the motor industry. Nevertheless, for the first time sales exceeded £20 million."

F. W. Berk and Co. Ltd. Profit before taxation for the year ended December 31, 1960, was approximately £679,000 (£522,520). A final dividend of 6d. per 5s. share is recommended which together with the interim dividend makes a total of 8¼d. per ordinary share (7½d.).

Jeyes' Sanitary Compounds Co. Ltd. have announced a final dividend for 1960, on capital increased to £655,500 (£437,000) of 8d per share, less tax, making a total of 1s. less tax for the year, equivalent to 1s. 6d. (1s. 3d.) on the 1959 capital. Group profit before taxation £261,887 (£345,523), after deduction of taxation £148,300 (£172,593).

Unilever Ltd. and Unilever N.V. Total turnover for the year ending December 31, 1960, was £1,847 million (£1,787 million). Profit after tax for N.V. was £22·5 million (£29 million) and for Limited was £29·8 million (£29·4 million). Consolidated net profit of both companies combined was £51·7 million (£60·1 million).

Albright and Wilson Ltd. A second interim dividend for 1960 of 14% on the ordinary capital has been declared. This dividend makes the total for 1960 20% compared with 18·3% for 1959. Group net profit for 1960 (unaudited) was £2,654,000 (£2,433,000 as previously published for 1959 or £2,624,000 adjusted to include Boake Roberts profits).

Meetings

Royal Institute of Chemistry

April 6. "Isotopes in industry," by W. G. Busbridge. 7 p.m. Sun Hotel, Chatham.

April 19. "Chemotherapeutic research," by F. L. Rose. 7.30 p.m. College of Technology, Luton.

The Chemical Society

April 12-14. Symposia on "Developments in the chemistry of boron compounds," and "Some aspects of the chemistry of natural products." Liverpool.

April 20. "Electron configuration and structure of transition-metal complexes," by R. S. Nyholm. 5.15 p.m. Chemistry Department, St. Salvator's College, St. Andrews.

April 24. "Stereochemistry of some dissolving metal reductions," by M. J. T. Robinson. 5 p.m. University Chemical Laboratory, Lensfield Road, Cambridge.

April 27. "Forensic science," by F. G. Tryhorn. 5.45 p.m. Chemistry Department, University College, Bangor.

April 28. "Chemistry of photography," by J. M. Taylor. 5.15 p.m. Chemistry Department, St. Salvator's College, St. Andrews.

May 4. "Some pathways in biosynthesis," by A. J. Birch. 7.30 p.m. Rooms of the Society, Burlington House, London, W.1.

May 4. "The electron spin resonance of some inorganic crystals," by H. C. Longuet-Higgins. 5 p.m. Department of Chemistry, Hull University.

May 8. "Recent advances in the chemistry of D vitamins," by B. Lythgoe. 5 p.m. Science Laboratories, Durham University.

The Faraday Society

April 11-12. "Radiation effects in inorganic solids." Part I. Metals and alloys. Part II. Non-metallic solids. Centre d'Études Nucleaires de Saclay, Gif-sur-Yvette (S.-et-O.), France.

Pharmaceutical Society

April 13. "Pharmaceutical education in the United States—the changing scene," by Louis W. Busse. 7.30 p.m. 17 Bloomsbury Square, London, W.C.1.

Society for Analytical Chemistry

April 26. "Spectrofluorimetry," by C. A. Parker, and "Tesla luminescence," by R. J. Magee. 7 p.m. Birmingham University, Edgbaston. 3 p.m. Visit to the Mond Nickel Co. Ltd.

April 28. "Ion exchange," by T. R. E. Kressman, and "The determination of nitrates with particular emphasis on the use of dead-stop titrimetry," by A. F. Williams. 7.15 p.m. Central Hotel, Victoria Viaduct, Carlisle.

Institution of Chemical Engineers

April 11. "A systematic classification of chemical processes and equipment," by K. Fischbeck. 6 p.m. 14 Belgrave Square, London, S.W.1.

April 12. "New metals and alloys as materials of construction"—morning session, 9.30. "New non-metallic materials of construction"—afternoon session. Chemical Engineering Department, Birmingham University, Edgbaston.

April 19. "Some corrosion problems in the chemical industry," by D. Bennion. 7.30 p.m. Grosvenor Museum, Chester.

Fertiliser Society

April 13-15. Visit to fertiliser factories in Holland.

May 11. Visit to works of Fisons Fertilizers Ltd. at Stanford-le-Hope and Shell Chemical Co. Ltd. at Shell Haven. A.G.M.

Society of Chemical Industry

April 10. A.G.M. and annual dinner. "The colloidal stability of polymer emulsions," by E. G. Cockbain. 5.30 p.m. 14 Belgrave Square, London, S.W.1.

April 10. "Pharmaceutical products from dyestuffs and intermediates," 9.30 a.m. Houldsworth School of Applied Science. Works visit 2 p.m. A.G.M. and dinner 6.30 p.m.

April 11. "Newer methods of purification of organic chemicals." 9.30 a.m. Houldsworth School of Applied Science.

April 11. "Laboratory architecture," by B. R. Williams. 2.30 p.m. Chemistry Department, Birmingham University.

April 17. A.G.M. "Economics and crop protection," by G. Edmund-Jones. 5.30 p.m. 14 Belgrave Square, London, S.W.1.

April 19. "Infra-red spectroscopy," by L. J. Bellamy. 7 p.m. University College, Cardiff.

April 19. "The chemist and the internal combustion engine," by W. S. Sellers. Chemistry Department, Trinity College, Dublin.

April 20. A.G.M. "Some laboratory investigations in connexion with the development of cationic emulsions," by C. H. Brown. 6 p.m. 14 Belgrave Square, London, S.W.1.

April 21. A.G.M. "Newer developments in carcinochemotherapy," by F. Bergel. 6.30 p.m. 14 Belgrave Square, London, S.W.1.

April 24. "Diet as preventive medicine," "Vitamins," by A. P. Meiklejohn. "Trace elements and minerals," by E. M. Widdowson. "The prevention of obesity," by J. Yudkin. 2.30 p.m. Blackpool.

April 24. Jubilee memorial lecture. "Polymer science in the university," by G. Gee. 6.30 p.m. 14 Belgrave Square, London, S.W.1.

April 25. "The rheology of concentrated polymer solutions," by A. S. Lodge. 6.30 p.m. 14 Belgrave Square, London, S.W.1.

April 26. A.G.M. 5.45 p.m. Hurter Memorial Lecture: "Inorganic chemical research in the D.S.I.R.," by Sir Harry Melville. 6.30 p.m. Donnan Laboratories, Liverpool University, Vine Street.

April 26. A.G.M. Address by 1959 and 1960 Saville Shaw Medallists. 6.30 p.m. Chemistry Department, King's College, Newcastle upon Tyne.

April 27. A.G.M. "Recent microbiological problems in industry," by H. J. Bunker. 6 p.m. 14 Belgrave Square, London, S.W.1.

April 28. "Modern food legislation in relation to food additives," by C. A. Adams. 7 p.m. University College, Cardiff.

May 1. Chairman's address by E. G. Peppiatt. 6.30 p.m. 14 Belgrave Square, London, S.W.1.

May 4. "Your glass of sherry"—film and sherry tasting party. 6.30 p.m. University Club, Mount Pleasant, Liverpool.

May 4. Arthur Guinness, Son and Co. Ltd., Park Royal Brewery, London, N.W.10. 2.30 p.m. Works visit.

May 5. "Water and water supplies," by E. L. Streatfield. 5 p.m. Washington Singer Laboratories, Exeter University.

May 8. A.G.M. 6 p.m. 14 Belgrave Square, London, S.W.1.

May 9. Symposium on highlights of requirements of a new chemical plant project: "Financing a new chemical plant project," by K. C. P. Barrington. "Selecting a site for a new chemical plant project," by J. L. Murdoch. "Designing and building a new chemical plant project," by T. T. Whipple. 2.30 p.m. Assembly Hall, Royal Commonwealth Society, London, W.C.2.

International Cosmetic Congress

The Second Congress of the International Federation of Societies of Cosmetic Chemists, organised by the Society of Cosmetic Chemists of G.B., will take place in London from July 2-5, 1962.

The themes of the congress will be biological aspects and physical chemistry. Anyone wishing to submit a paper describing original work should contact the Hon. Organiser, A. Herzka, c/o Pressurized Packaging Consultants Ltd., Ashbourne House, Alberon Gardens, London, N.W.11.

Oral progestogen

Allylestrenol (*Gestanin*—Organon), a new orally active synthetic progestogen, is described as being completely free from androgenic activity and exceptionally well tolerated, by two gynæcologists writing in the *Lancet* (1961, (7169), 134). Other oral substitutes for progesterone tested in the past produced symptoms of intolerance and a tendency to virilisation. In the 50-odd cases described in the paper, *Gestanin* "has proved in most cases a satisfactory oral progestogen."

Detergent-steriliser combination

Deogen Liquid 3X (concentrate) is a new combined detergent/steriliser marketed by the hygiene division of Diversey (U.K.) Ltd. for hospitals.

Simple equipment has been developed for automatically dispensing the detergent/steriliser. The *Diversey Proportioner*, which can be easily attached to almost any type of tap, entirely eliminates wastage due to hand dosing and also ensures correct strength of working solutions. While the normal flow of clear water can be obtained from the tap, a single pressure of the control button causes *Deogen* Liquid 3X solution to be delivered at exactly the correct strength.

Anti-bacterial ointment

The Distillers Co. (Biochemicals) Ltd. have introduced *Zynotracin* ointment containing the topical antibiotics xanthocillin and zinc bacitracin with hydrocortisone in a wool fat/paraffin base. The product possesses both anti-bacterial and anti-inflammatory properties.

Formula:

Xanthocillin	4·5 mg.
Zinc bacitracin	500 units
Hydrocortisone B.P.	10 mg.
Wool fat/paraffin base to ..	1·0 g.

Because these antibiotics are reserved for topical application it is claimed that the possibility of prejudicing any systemic antibiotic treatment is minimised and neither appears to give rise to irritation or allergic reactions.

In combination xanthocillin and zinc bacitracin provide an effective attack against Gram-positive and Gram-negative organisms commonly found in skin infections; xanthocillin also possesses suppressive action against certain pathogenic fungi and yeasts. It has not been found possible to induce resistance to xanthocillin and there is no evidence of cross-resistance. Bacteria are very slow in developing resistance to bacitracin.

Hydrocortisone applied topically possesses both anti-inflammatory and anti-pruritic effects and is of value in reducing the inflammation, irritation and allergic manifestations which are present in many skin affections.

Typical indications for *Zynotracin* ointment include infected infantile and allergic eczema; seborrhœa and contact dermatitis; varicose and other indolent ulcers; sycosis barbæ; ano-genital pruritis and otitis externa.

Packs and prices are: tube of 5 g., 8s. 3d. (5s. 6d., trade); 15 g., 22s. 6d. (15s., trade); ex. P.T. The product is subject to the Therapeutic Substances Act (Part 2) and is obtainable only upon prescription.

Millophyline ampoules

Millophyline, a bronchodilator preparation already marketed by Dales Pharmaceuticals Ltd. in the form of tablets, is now available in 5 ml. ampoules containing 0·7 gm. of the active ingredient for intramuscular injection. The ampoules are packed in boxes of 6 and 48; retail price of box of six is 8d. 6d.

Ampholytic germicide

D. G. Bennett Chemicals have introduced a new water-soluble, non-toxic, ampholytic surface-active agent which is claimed to have outstanding germicidal properties.

Oral diuretic

Navidrex is claimed by its manufacturers, Ciba Laboratories Ltd., to be "the most potent oral diuretic yet available." It is 6-chloro-3-cyclopentylmethyl - 3,4 - dihydro - 7 - sulphamoyl - 2H - 1,2,4 - benzothiadiazine 1,1-dioxide; a dose of 0·25 to 1 mg. is said to achieve a diuresis comparable to that produced by 500 to 2,000 mg. chlorothiazide. Trade prices of the 0·5 mg. tablet are 6s. for 25, 22s. 6d. for 100, and 108s. 9d. for 500 (exempt P.T.).

Napkin rash ointment

A new and simple preparation for the prevention and treatment of napkin rash for infants has been marketed under the name *Natusol* by Thos. Kerfoot and Co. Ltd.

It is a greasy ointment containing 2·85% of boric acid with 0·18% of borax in a base consisting of soft paraffin, wool fat and glycerine. It is an apparently simple formulation which was worked out by Alfred Benzon in Copenhagen and very carefully examined by Kerfoots when they obtained the English rights. It is based on two fundamental and proven assumptions. The first is that the skin in health is normally slightly acid, whereas in disease, and in particular in the condition for which *Natusol* was devised, it tends to be alkaline. Secondly, this alkalinity is largely due to bacterial decomposition of excreta contained in the napkin. The object was to find an acid material which is non-irritant, non-toxic, non-allergenic, and which will not only neutralise the alkalinity, both in the material in contact with the skin and of the skin itself, but will at the same time inhibit the growth of the organisms which produce that alkalinity. Boric acid combines both these qualities. A small proportion of borax is included for its buffering action which prolongs the acidifying effect of the boric acid in order to maintain the natural acid balance of the skin for as long as possible between toilets.

The product retails at 2s. 9d. per tube and is sold in a triangular pack which lends itself to unusual window and counter display.

Gastric antibiotic

The Distillers Co. (Biochemicals) Ltd. are now making *Orastrep* in the form of tablets (containing streptomycin sulphate 0·25 gm. base and sulphadimidine 0·25 gm. per tablet) and as a pleasantly-flavoured and ready-prepared suspension (containing streptomycin sulphate 0·5 gm. base, sulphadimidine 0·5 gm. and light kaolin 1·5 gm. per 5 ml. teaspoonful).

The product offers a twofold attack against commonly-occurring bacterial infections of the intestinal tract including bacillary dysentery, infantile gastro-enteritis and bacterial food poisoning. With oral administration the streptomycin is concentrated within the gut to combat the causative pathogens, while the sulphadimidine is absorbed and exerts its effect *via* the blood stream against pathogens which have penetrated deeply into the intestinal wall. Light kaolin included in the suspension for its adsorbent properties assists in the consolidation of fluid fæces.

Orastrep tablets in bottles retail at 13s. 9d. for 25, 47s. 6d. for 100, and 217s. 6d. for 500.

Orastrep suspension in bottles of 50 ml. retails at 12s. 6d. (all exempt P.T.).

Orastrep is subject to T.S.A. (Part II) and Schedule 4B of the Poisons Regulations and may be supplied upon prescription only.

Versatile intermediate

Coalite and Chemical Products Ltd., Chesterfield, are now manufacturing *meta*-tertiary butyl phenol. Pilot plant quantities are available for evaluation both in the pure form and as a mixture of *meta* and *para* tertiary butyl phenol.

This new chemical is recommended for coating and adhesive resins, antioxidants, lube oil additives, anti-skinning agents, oil demulsifiers, etc.

News from Abroad

AUSTRALIA

Stronger Salk vaccine

Scientists at the Australian Commonwealth Serum Laboratories in Melbourne are developing a more powerful type of Salk antipolio vaccine. Laboratories director Dr. Bazeley stated that it should raise the protection rate for immunised persons to 95%—5% higher than the American Salk version now being used.

New antibiotic company

Drug Houses of Australia Ltd. is to link with the American Cyanamid Co. in a venture for formulating, packaging and distributing antibiotic products.

FRANCE

Industrial Chemistry Congress

The 33rd International Congress of Industrial Chemistry will take place in Bordeaux from October 1-8. It will be preceded by three days connected with chemical engineering at Toulouse from September 28-30.

Among the 23 sections covered will be pharmaceutical and industrial chemistry, photographic products, soaps and detergents.

CANADA

International Congress of Pure and Applied Chemistry

Leading scientists from many countries will be heard at the 18th International Congress of Pure and Applied Chemistry to be held in Montreal, Canada, from August 6 to 12, 1961.

Plenary lecturers who will participate are Prof. F. S. Dainton, Leeds University, who will speak on "New horizons in physical chemistry"; Prof. R. Daudel of the National Laboratory for Scientific Research, Paris, who will lecture on "Some recent results concerning the relations between structure and chemical reactivity of organic molecules"; Prof. G. Schwarzenbach of the Laboratory for Inorganic Chemistry, Zurich, who will speak on "Metastable products of inorganic molecules and ions formed by proton addition and elimination"; and Prof. R. H. Wilhelm of Princeton University, Princeton, N.J., U.S.A., who will deal with "Progress towards the *a priori* design of chemical reactors." Academician N. N. Semenov of the Academy of Sciences, Moscow, has also been invited to speak at a plenary session.

Some 70 sectional lectures will be delivered on the various aspects of the four divisions of chemistry with which the conference will deal.

SOUTH AFRICA

Help for students

A total of £600 in bursaries has been awarded to successful pharmacy students by the South African Druggists Ltd. Ten students from pharmacy schools throughout the Union will receive £60 a year for their studies.

"Fab" factory

The recently-opened £2,500,000 *Fab* detergent factory of Colgate-Palmolive Ltd., at Boksburg, Transvaal, employs about 600 workers who will earn about £400,000 annually. More than £1,650,000 worth of materials, mostly of South African origin, will be used. Water consumption is estimated at 30 million gal. a year.

New urea plant

With the opening of the new urea plant of African Explosives and Chemical Industries Ltd., attention has again been drawn to the importance of fertilisers in South Africa. The production of urea locally is a further step in the progressive development of the farming industry, for not only is it the most concentrated form of solid nitrogen—in 1959 more than 45,000 tons of nitrogenous fertilisers were used on South African crops—but it is also highly suitable as a supplementary cattle feed.

Wholesalers want better terms

Manufacturing chemists throughout South Africa have received circulars from wholesalers seeking better terms of trade. The circulars have been sent in the name of all major wholesalers, such as Adcock-Ingram Chemists Ltd., BOJ Pharmaceuticals Ltd., Dominion Drug Co. (Pty.) Ltd., Newport Trading Corporation Ltd., Pretoria Wholesale Druggists (Pty.) Ltd., Sana Ltd. and South African Druggists Ltd. The wholesalers ask for a rebate of 17½% on goods generally supplied at a rebate of 15% except for surgical dressings, plaster, etc., where they want 20%. They also ask for a minimum period of 30 days from statement for the settlement of accounts. Manufacturers now ask for cash on delivery or payment within seven days.

Parathion menace

Drastic measures to control the use of poisonous insecticides are being advocated. In one year 200 cases of parathion poisoning were treated at just one hospital. Seven children died recently from insecticide poisoning on farms in the Western Cape. Organic phosphorus poisons are so dangerous that if a child plays with an empty container and then eats food without washing his hands he is likely to die. There is also a danger from touching plants recently sprayed. The best the Department of Agriculture has been able to do was to issue a "serious appeal" to the public, and especially to farmers, to be cautious in the use of insecticides. A farming journal asked if the Department expected a six-year-old boy to recognise a battered old tin lying at the edge of a field to be lethal. Surely safety does not lie in the uttering of occasional warnings, but rather in making an urgent appeal to chemists to produce effective insecticides which are not a menace to human and animal life.

The pattern over the past ten years or so shows clearly that insects fight back effectively simply by becoming resistant to whatever poison is being used.

A programme to combat the danger of some insecticides could include better and more effective publicity concerning the dangers of organic phosphorus poisons; urgent research to find equally effective but safe insecticides; and reorganisation of farming methods to reduce the excessive use of poisons. It has also been suggested that these poisons should be made available only to registered pest exterminators.

INDIA

Hungarian aid for chemical plant manufacture

The New Standard Engineering Co. and Biological Products Ltd. have successfully sought the collaboration of the Hungarian People's Republic in the manufacture of chemical machinery and basic pharmaceuticals.

Hungary will supply machinery for which payments will be made in non-convertible rupees by the Indian partners for three years or more. Hungary has stipulated that the products of the new factories should not be exported beyond neighbouring countries like Burma, Ceylon and Pakistan.

The manufacture of chemical machinery will be undertaken by a new company to be floated by the New Standard Engineering Co. Capital outlay will be of the order of Rs.40 lakhs (£300,000). The collaborators, Nikex of Budapest, will supply the necessary equipment worth about Rs.28 lakhs (£210,000). The factory is expected to go into production by the end of this year and will manufacture annually 400-480 vessels of capacities ranging from 100 to 1,250 litres, glass enamelled acid-alkali-resistant mixers, condensers, receivers, evaporating pans and distillation plants.

The Hungarian Government has already agreed to the proposals of Biological Products Ltd. for the manufacture of basic pharmaceuticals like pepsine, peptone and pancreatic fluid in Hyderabad.

VIET-NAM

Pharmaceutical project

A new VN$ 30 million pharmaceutical plant is being built by Vinaspecia, a subsidiary of Specia, at Vinh Hoi, Viet-Nam. It is scheduled to come into operation next July.

The plant will manufacture drugs like aspirin, sanadrin and dagenan, now in great demand, and will then turn out more complicated medicines including antibiotics and injection products. The medicines will be made under the licence of the Specia firm, which will also supply raw materials and technical aid.

The equipment for the plant would cost VN$ 16 million. A VN$ 20 million development programme has also been projected.

MEXICO

Kestner plant to be made

Kestner Evaporator and Engineering Co. Ltd., of London, has licensed Dicon S.A. de C.V., Avenida Popocatepetl 26–302, Mexico City, to manufacture many of their chemical engineering products, on a "Made in Mexico" basis. These products include evaporators, crystallisers, dryers, and acid proof equipment.

A licence has also be granted to Dicon by Richard M. Armstrong Co. of Pennsylvania, U.S.A., to manufacture Armstrong heat transfer equipment in Mexico. This includes shell and tube exchangers for chemical and petroleum plants, air cooled heat exchangers, vaporisers and refrigeration shell and tube apparatus, including scraped shell heat exchangers for oil refining.

Dicon is building a plant to manufacture Kestner and Armstrong products in the Colonia Vallejo area of Mexico City. Manager of Dicon is Ingenieur Christof von Eiff, a Mexican national.

DOMINICAN REPUBLIC

Saffron *v.* cholesterol

The Dominican Republic is to launch a full-scale saffron-growing campaign. The plant is produced commercially in Mexico, where the oil extracted is used in proprietary preparations which are said to reduce the cholesterol danger.

The plant will be used in the Republic in the processing of milk and cheese, and the oil from the seeds will be used in cattle feed and in soaps and paint.

GERMANY

Pfizer expand

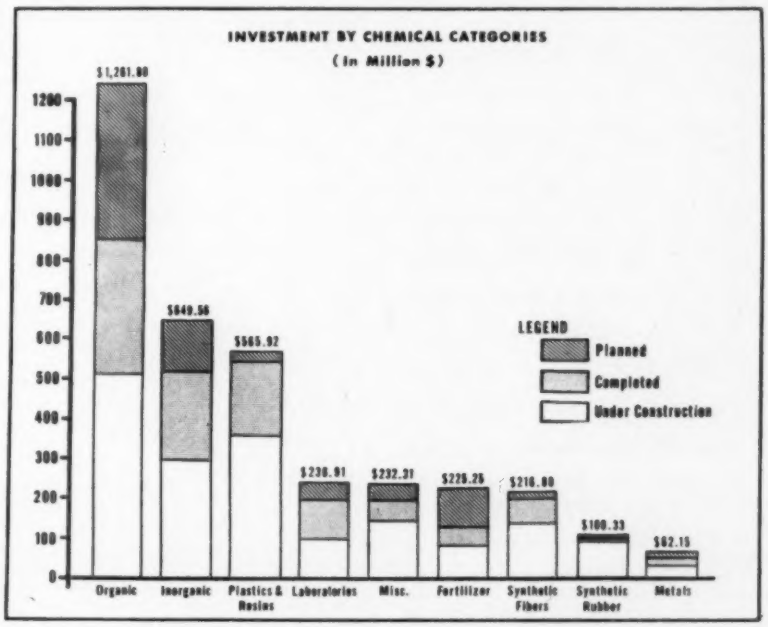
Pfizer G.m.b.H. of Karlsruhe (wholly-owned German subsidiary of Chas. Pfizer Co. Inc.) recently increased its basic capital from DM. 500,000 to DM. 8 million.

The company, which started operations in Western Germany in April 1959, recently opened a new administrative HQ at Karlsruhe-Hagsfeld. Several laboratories and manufacturing plants are being built in the vicinity.

UNITED STATES

A record 3.5 billion dollars invested in chemicals

The annual construction survey released by the Manufacturing Chemists' Association Inc. shows that for 1960-61 American companies which manufacture chemicals, both within and without the chemical industry proper, constructed, are building or are planning to build facilities estimated to cost 3,551,030,000 dollars. This is the second highest total ever reported by the M.C.A. The biggest was in 1958—3·84 billion dollars.



With chemical industry sales at a record 27·7 billion dollars, and construction funds at their second highest level in the industry's history, the outlook for consumers of chemical products is bright. But, net earnings are down and chemical companies are searching for means to hold down costs so that even more can be spent on research and production.

Of the total 3·5 billion dollars—

More than 1 billion dollars were spent on facilities completed in 1960;

1·7 billion dollars were appropriated for facilities under construction in 1960; and

772·4 million dollars will be used for construction in 1961.

The products on which money is being spent are shown in the above groups. Total cost of laboratories in the under-construction category is estimated at 96·6 million dollars.

The survey includes only privately financed projects and covers 348 companies, 111 of which are considered non-chemical. The non-chemical companies are those whose production primarily is in fields other than chemicals, such as steel, automobiles, paper and pulp, and petroleum.

HUNGARY

Chemical plants in open

A number of installations scheduled for inclusion in Hungary's latest chemical industry building projects are to be sited in the open, under a recent Government order. Other industries may follow suit.

In January a spokesman for the chemical industry said that 42% of present investments are taken up by building costs.

If certain machinery could be placed outdoors, cost of buildings could be reduced to 33% of the investment programme.

A statement issued with the order said that though some of the installations will have to be redesigned to give adequate weather protection there are great advantages in the scheme: building costs will be cut, time will be saved and the projects will come into operation earlier than planned.

With the new sulphuric acid works under construction at the Tisza Chemical Works at Szolnok at least 25 million forints (£750,000) will be saved in building costs by outdoor installations.

Similar orders to planners have also been issued for the country's aluminium and mineral oil industries.

NEW TRADE MARKS

APPLICATIONS

Pharmaceuticals

ALBUMISOL.—804,070. *Merck and Co. Inc.*

GALA OF LONDON.—804,415, GALA. 804,416. *Gala of London Ltd.*

VIRULON.—805,193. *Winthrop Group Ltd.*

ADURNON.—805,335, SEPTOBERON. 805,338, SULMABERON.—805,339. *C. H. Boehringer Sohn.*

ZOYLIN.—805,340. *C. H. Boehringer Sohn.*

NISOREX.—805,531. *J. R. Geigy S.A.*

SYSTATHION.—806,466. *May and Baker Ltd.*

HYPERCONTRAL.—805,885. *C. H. Boehringer Sohn.*

DEVDRILL.—806,804. *Scai Societa Commerciale d'Applications Industrielles.*

DILOSYN.—807,092. *The British Drug Houses Ltd.*

KEMELEN.—807,286. *Pharmacy Products (Overseas) Ltd.*

CALCIMELLEN.—807,723. *C. H. Boehringer Sohn.*

PASINAH-6PH.—808,254. *A. Wander Ltd.*

CAMOPRIMA.—808,365. *Parke, Davis and Co.*

PASINAH-PH6.—808,492. *A. Wander Ltd.*

BETICASE.—808,731. *Merck and Co. Inc.*

MATRABEC.—808,808. *Parke, Davis and Co.*

CARIPEPTIC.—809,296. *Upjohn of England Ltd.*

LEOSTESIN.—809,660. *Lovens Kemiske Fabriks Handelsaktieselskab.*

NIMCAL.—809,860. *Phillips, Scott and Turner Ltd.*

FULLCIRCLE.—810,198. *R. J. Fullwood and Bland Ltd.*

RHEUMADY.—810,534. *Garron Products.*

BIOCLEAR.—805,128. *Helena Rubinstein Ltd.*

LOZILS.—805,189; URISAL.—805,192. *Winthrop Group Ltd.*

ORASTREP.—805,321. *The Distillers Co. (Biochemicals) Ltd.*

PRACTARGIN. — 806,339. *Chemische Werke Albert.*

VETWA.—807,616. *A. W. Dobbs and Co. Ltd.*

NEW PATENTS

COMPLETE SPECIFICATIONS ACCEPTED

Dyestuffs

Water-soluble monoazo dyestuffs containing acryloylamino groups and their production. *Badische Anilin- & Soda-Fabrik A.G.* 862,318.

Monoazo dyestuffs and their metal complex compounds. *Sandoz Ltd.* 862,374.

Phenothiazine derivatives. *G. D. Searle and Co.* 861,807.

Sulphur dyestuffs. *Cassella Farbwerke Mainkur A.G.* 862,218.

Dyestuffs of the stilbene series. *Imperial Chemical Industries Ltd.* 862,225.

Miscellaneous

Hydrogen peroxide compositions. *Ashe Chemical Ltd.* 859,550.

Production of 1-phenylcyclo-hexane-1-hydroperoxide. *Montecatini Soc. Generale per l'Industria Mineraria e Chimica.* 859,850.

Basically substituted butyric acid anilides and process for their manufacture. *Farbwerke Hoechst Aktiengesellschaft Vorm. Meister, Lucius and Brüning.* 859,385.

Process for the manufacture of pure chloroprene. *Knapsack-Griesheim A.G.* 859,401.

Ferromagnetic materials and processes for their preparation. *E. I. Du Pont dei Nemours and Co.* 859,937.

2-Halogencycloheptene - (1) - carboxylic acid-(1)-esters and their production. *Badische Anilin- and Soda-Fabrik A.G.* 859,697.

Preparation of perchloryl fluoride. *Pennsalt Chemicals Corporation.* 859,492.

Process for the continuous production of copolymers of ethylene. *Farbenfabriken Bayer A.G.* 859,743.

Method for production of sulphur-containing carboxylic-ester adducts and products so-called. *Rohm and Haas Co.* 859,773.

Process for the production of 2-trans-β-ionylidene acetic acid. *Farbenfabriken Bayer A.G.* 859,399.

Aliphatic organic diphosphines. *Imperial Chemical Industries Ltd.* 859,391.

New patents are from the *Journal of Patents*, and new trade marks are from the *Trade Marks Journal*. In each case permission to publish has been given by the controller of Her Majesty's Stationery Office. Each of the publications mentioned is obtainable from the Patent Office, 26 Southampton Buildings, London, W.C.2.

NEW COMPANIES

These particulars of new companies have been extracted from the daily register of Jordan and Sons Ltd., company registration agents, Chancery Lane, London, W.C.2.

R. D. Baker (Chemists) Ltd. 9.1.61. The Pharmacy, Market Place, Snettisham, Norfolk. £5,000. Dirs.: R. D. Baker and A. S. Mobbs.

A. J. McWaters and Co. Ltd. 10.1.61. 23 Hanover Street, Liverpool. Mfg. chemists and druggists. £6,000. Dirs.: A. J. McWaters and C. Orrell.

F. W. Sellwood Ltd. 11.1.61. 183A Field End Road, Eastcote, Pinner, Mddx. To take over the bus. of a dispensing chemist, etc. cd. on by F. W. Sellwood at 8 Heather Park Parade, Wembley, Mddx., as "F. W. Sellwood." £100. Dirs.: F. W., I. A. and A. M. Sellwood.

J. R. Harman (Chemist) Co. Ltd. 12.1.61. 261 London Road, St. Leonards-on-Sea. To take over bus. cd. on as "Springfield Pharmacy" by J. R. Harman. £1,000. Dirs.: J. H. and R. P. Harman.

Lerc Ltd. 17.1.61. Wern Mills, Nannerch, Flints. To carry on bus. of mnfrs. of and dlrs. in chemicals. £1,000. Dirs. to be apptd. Subs.: H. E. and M. E. Platt.

A. Grosvenor (Rubery Pharmacy) Ltd. 23.12.60. 108/110 New Road, Rubery, nr. Birmingham. £1,000. Dirs.: A. and M. Grosvenor.

D. W. Thomas Farm (Chemicals) Ltd. 7.2.61. 22 High Street, Newtown, Mont. £1,000. Dirs.: David W. and Mrs. F. A. Thomas.

W. Talvan Rees Ltd. 7.2.61. 241 High Street, Cheltenham. Chemists. £1,000. Dirs.: W. T. and E. M. Rees.

Alstone Pharmacy Ltd. 7.2.61. 450 High Street, Cheltenham. Details similar to W. Talvan Rees Ltd.

Angus Mackay (Chemists) Ltd. 7.2.61. 193 Broadway, London, N.W.9. £100. Dirs.: Percy W., Michael W. and Derrick H. Reding.

Cuthbert Pharmacies Ltd. 7.2.61. 110 West Heath Road, Farnborough, Hants. £100. Dirs.: B. P. Block, A. W. Cuthbert and G. Dworkin.

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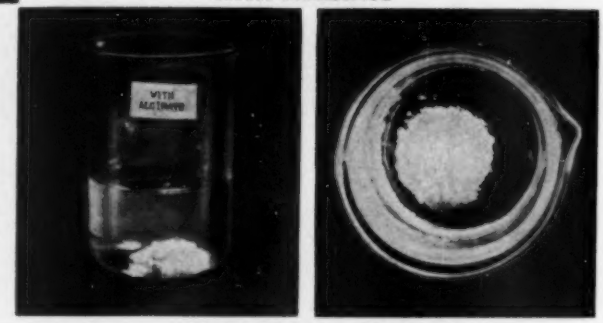

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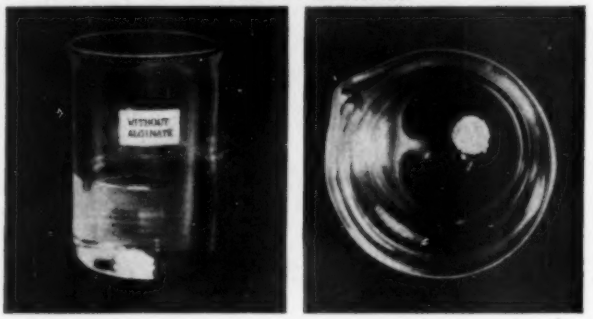

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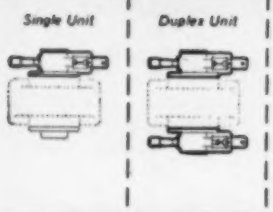

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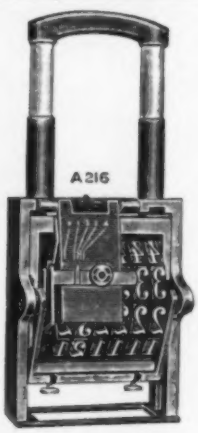

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Ref. B.82. British. Male Married. Age 25. O.N.C. (Inst). H.N.C. (Mech). with endorsement, C & G. (M/C Shop Engg). Grad. I. Mech.E. 5 yrs. Student Apprentice, 1 yr. Technical Assistant & 1 yr. Assistant to Works Manager, mnfr. of instruments, clocks & watches. At present Development Technician aircraft accessory mnfr. Seeks **DESIGN/DEVELOPMENT AND/OR TESTING POST.** pref. motor industry. £1,000 p.a. approx.

Ref. B.83. British. Male. Married. Age 41. O.N.C. M. Soc. Instrument Technology. M. Inst. Journalists (Technical). A.M.Soc. of Engr. 10 yrs. Instrument Maker (Instructor). R.A.F. 4 yrs. Sales Engineer, industl. instrument makers. 4 yrs. Sales Engr./Instructor in company's Technical school, sound equipment makers (cinema). 3 yrs. Senr. Specification Engr. & Tech. Writer. 3 yrs. Senr. Contracts Engr. & Tech. Writer, industl. instrument makers. At present Sales Engr. (Departmental Head), industl., scientific & medical instrument makers. Seeks post as **ASSISTANT SALES MANAGER OR SENIOR REPRESENTATIVE.** S.E. England. Pref. Sussex. £1,000 p.a. basic.

Ref. B.87. British. Male. Married. Age 32. H.N. Engg. Cert. (Distinctions all subjects), A.F.R.Ae.S. 5 yrs. Engr. Apprentice, aircraft & aero engine mnfr. 2 yrs. Designer, aero engine mnfr. 6 yrs. i/c Devpt. Design on Prod. Devpt. also genl. mechanical, aircraft mnfr. At present Designer-in-Charge m/c tools, m/c tools & aircraft mnfr. (Lecturer in various subjects of Nat. Cert. Courses. Successful applier for no. of patent applications. Commercial exper. of engg. buying & sub-contract.) Seeks post as **CHIEF DESIGNER/CHIEF DEVPT. ENGR./CHIEF ENGR.** U.K.—not London—£2,000 p.a.

Ref. B.88. British. Male. Married. Age 38. Diploma in Public Administration Exper. includes 7 yrs. Committee Clerk. 2 yrs. Office Manager. Institute. 1 yr. Office Manager. marine assurance. 2½ yrs. O. & M. Consultant, industrial & local govt. O. & M. & Work Study consultants. Seeks **O. & M. OR GENERAL ADMINISTRATIVE POST.** U.K. £1,550 p.a.

Ref. B.90. British. Male. Single. Age 23. H.N.C. (E.E.) & endorsements in applied Electronics, Mechanics & Physics. 5 yrs. Apprentice, 1½ yrs. Circuit Designer & at present Engr. i/c Design Laboratory (Devpt. & Supervision of prod.), mnfrs. of special purpose TV, closed circuit TV, radio monitors & other electronic equipt. Seeks post in **DESIGN & SUPERVISION TRANSMITTER INSTALLATION.** £1,000 p.a.

Ref. B.91. British. Male. Married. Age 50. A.M.I.B.F. 11 yrs. from Pupil to Chief Assist. Metallurgist, engr. & ironfounders. 11 yrs. Inspection Duties & Contracts Production Progression, civil service. 1 yr. Foundry Methods Engr., & 3 yrs. Asst. Foundry Manager, heating engrs, ironfounders. At present Foundry Manager, hydraulics Engr. & Ironfounders. Exper. Prod. of blackheart malleable iron, high duty cast iron, aluminium, copper base, zinc base. Seeks **FOUNDRY OR WORKS MANAGEMENT APPOINTMENT.** U.K. £1,400 p.a. min.

Ref. B.93. British. Female. Married. Age 48. B.Sc. (Chem.). 2 yrs. Analyst/Technician, hospital laboratory. 4 yrs. Laboratory Assistant (analysis), bleaching association. Good knowledge German & French. Seeks post as **CHEMIST/ASST. CHEMIST/LABORATORY ASSISTANT.** London area—pref. N.W. London. £750 p.a. approx.

Ref. B.95. British. Male. Married. Age 47. B.Sc., Diploma in Electrical Engg. 10 yrs. Electrical Engr., electrical engrs. 7 yrs. Chief Elec., Engr. gold mining, 2½ yrs. Chief Engineer., goldmines. 1 yr. Senr. Educational Officer (Technical). govt. Dept. W. Africa. Seeks post as **ELECTRICAL ENGR.** Far East, Europe, Canada, S. America or Ireland, £2,500 p.a.

Ref. B.97. Swiss. Male. Married. Age 31. Resident U.K. Combined 1st Class Cert. for Marine Engr. 10 yrs. Engr/Chief Engr. cargo & tankships. 1 yr. Marine engr & at present Chief Engineer, i/c mech. dept. of boat. Good knowledge boilers, steam engines & turbines, diesels, electricity, refrigeration. Seeks post as Mechanical Engineer, Abroad—pref. West Indies. £1,200 p.a. min.

Ref. B.98. German Male. Married. Age 35. Qualifications in Power Plant, Pumping Work (Diesel & Electromotors). 2 yrs. Engr., pumpwork—power plant. 3 yrs. Overseas, pumping station pipework, oil-exploration pipework. 3 yrs. Shift Engineer, power & pumping station. At present Chief Charge Engineer, U.S. army contract in Turkey. Exper. Photogrammetry, Languages: English, German, Russian. Seeks post as **ENGINEER,** Middle East, 550 dollars per month.

Ref. B.99. British. Male. Married. Age 36. H.N.C. Electrical. A.M.Inst. Plant. E. 5 yrs. Student Apprentice, switchgear & control gear mnfr. 3 yrs. Junr. Engr., circuit design, electrical equipt. mnfr. 5½ yrs. Electrical Designer (elec. instllns.), oil & chemical refining. At present Electrical Section Leader (Design of Electrical Installns), chemical mnfr. Seeks post as **ELECTRICAL ENGR. (DESIGN AND/OR MAINTENANCE).** U.K.—not London—£1,500 p.a. approx.

Ref. B.100. British. Male. Married. Age 28. O.N.C. (Mech. Eng). Inter. C. & G. (Mech. Eng). 7 yrs. Apprentice, & 4 yrs. D/man, light precision

[*Continued on next page*

To: I.S.I.S. Appointments Register, 9, Eden Street, London, N.W.1. Please ask the following applicants to communicate with the undersigned:

Ref.:.....	**Ref.:**.....	**Ref.:**.....	**Ref.:**.....
Ref.:.....	**Ref.:**.....	**Ref.:**.....	**Ref.:**.....
Ref.:.....	**Ref.:**.....	**Ref.:**.....	**Ref.:**.....

Please use Block capitals

Name: .....

Position: .....

Company: .....

Business or Profession: .....

Address: .....

All introductions are made on the understanding that should an engagement result the employer agrees to I.S.I.S. Appointments Register's terms, which are as follows:

For each person engaged the equivalent of two weeks salary payable by the employer within fourteen days of the date of engagement.

Signature..... Date.....

I.S.I.S. APPOINTMENTS REGISTER (*Continued from overleaf*)

eng. tradeshop. 2½ yrs. Jig & Tool D/man & Checker, light precision engg company producing very small motors, gear boxes & switches. At present Senr. Designer & planner (press tools, jigs & fixtures), motor car mnfr. Seeks post as **DRAWING OFFICE CHECKER (PROD. ENG) OR TECHNICAL LIAISON POST.** London. £1,100 p.a.

Ref. B.102. British. Male. Married. Age 38. 7 yrs. Specialist Machinist on Prod. Devpt., motor industries. 3 yrs. Night Shift Foreman, aircraft engrs. At present M/C shop Foreman, motor accessories. Consid. exper. all types of copying m/cs (lathes, mills, autopilot lathes) & carbide tooling. Seeks post as **M/C SHOP FOREMAN.** U.K. £1,200 p.a.

Ref. B.103. British. Male. Single. Age 33. Nat. Cert. (Mech.Eng.) with endorsements in aeronautical subjects. A.R.Ae.S. 4 yrs. Apprentice & D/man aircraft mnfrs. 1 yr. D/man, aircraft refuelling company. 6 yrs. D/man, aircraft mnfr. 2 yrs. D/man, hydraulic brakes. 2 yrs. D/man & Standards Engr., aero products. Seeks post as **STANDARDS ENGINEER.** London. £1,000 p.a.

Ref. B.104. British. Male. Married. Age 31. O.N.C. & H.N.C. (Elect.), Grad. I.E.E. 4 yrs. Student Apprentice, electrical engg. 1 yr. Sales Trainee, electrical engg. 1½ yrs. Dev. Engr., lamp producers. 1½ yrs. Expt. Engr., biscuit & pudding mnfrs. At present Field Engineer (Electro-mech), special purpose equipt. Seeks **ELECTRO-MECHANICAL POST OF RESPONSIBILITY.** S. or S.E. England, £1,500 p.a.

Ref. B.105. British. Male. Single. Age 44. 8 yrs. Material Control/Junr. D/man, motor cycle mnfrs 17 yrs. Technical Assistant (Technical Liaison), gas turbine aero engine mnfrs. At present Technical Clerk, furnace engrs. to steelmaking industry. Fluent French & knowledge Italian. Seeks **TECHNICAL LIAISON OR TRANSLATION POST.** London or abroad—France pref. £1,000 p.a.

Ref. B.107. British. Male. Married. Age 21. Inter & Final C. & G. & now studying for O.N.C. (Building). 4 yrs. Apprentice Joiner, bldrs. At present Carpenter & Joiner, building contractors. Seeks post as **JUNR. D/MAN,** London, £550 p.a.

Ref. B.108. British. Male. Married. Age 39. C.D.A. (Glas.), F.R.S.A., M.C.I.M., A.M.Inst.W.S., A.C.I., Cert. in Dairying & personnel Mgt. Diploma. 4 yrs. Agricultural Officer, Sudan, with exper. most tropical crops & irrigation & large mechanised crop production schemes. 2 yrs. Agricultural Officer, Irrigation Scheme, Africa. At present employed in Research Division of African ministry of agriculture, with exper. of research in connection with use of insecticides, original work on coffee entomology, crop spraying & M/cy testing. Author of several articles published in Technical press. Now wishes to enter field of commercial agriculture and seeks post as **REPRESENTATIVE WITH MANAGEMENT PROSPECTS.** S. England. £900 p.a.

Ref. B.109. British. Male. Married. Age 29. H.N.C. (Elect.) and endorsements physics & advanced electronics. Stud.Brit I.R.E. 2 yrs. Technician (special, govt. work). 3 yrs. Technician, telecommunications. At present Engineer—instrumentation & analysis of results—guided weapons. Consid. exper. piezo-electric instrumentation & subsequent analysis of results, employing tape & film recording equipt. Seeks post as **ENGINEER OR TECHNICAL REPRESENTATIVE.** U.K. £1,250 p.a. min.

Ref. B.110. British. Male. Single. Age 39. A.M.Inst.Engg. Technology. 3 yrs. Welder, dockyard repair. 5 yrs. Welder, shipbuilder. 4 yrs. Inspector of Welding, shipbuilders. At present Welder (Shipyard), shipbuilders & marine engineers. Seeks post as **SHIP SURVEYOR** (Hull). U.K. or aborad. £1,250 p.a.

Ref. B.111. British. Male. Married. Age 43. B.Sc. (Metallurgy, Physics, Chem.). 2 yrs. Devpt. Engr., foundry work & mech. engg. 3 yrs. Metallurgist, light mech. engg. & foundry work. 9 yrs. Senr. Metallurgist/Assist. Chief Metallurgist, light mech. & elect. engg. 2 yrs. Chief Research Metallurgist foundry work & medium engg. 6 yrs. Assist. Chief Engr. (materials & methods light mech. & elect. engg. At present Chief Engr., light mech. & elect. engg. Seeks **TECHNICAL/ADMINISTRATIVE/TECHNICAL SALES APPOINTMENT.** London or S. England. £1,800/£2,500 p.a.

Ref. B.113. British. Male. Married. Age 30. B.A.(Maths.). Dip. of Imperial College—Chem. Engg., Grad. Inst. Chem. Engrs. 6 yrs. Commercial Assist., shipping company. 1 yr. Technical Sales Rep., chem. mnfrs. 1 yr. Design Engr., contractors to chem. & oil industries. 2 yrs. Sales Engr., chem. Plant mnfrs. At present Production Supervisor, chem mfrs. Languages: Italian & Spanish. Seeks **TECHNICAL SALES/DEVPT./PROD. MANAGEMENT/TECHNICAL MARKETING/OR ANY COMMERCIAL OR TECHNICAL POST IN CHEM. ENGG.** Abroad, pref. Japan, Thailand/Hong Kong/Singapore/S. America. £1,700 p.a. min.

Ref. B.114. British. Male. Single. Age 33. D.L.C. (Aero.Eng.). 2 yrs. Pilot, R.A.F. 2½ yrs. Stressman, engrs. 6 yrs. Pilot, airlines. At present Self-employed, driving school. Author of book on Driving. Seeks Editorial or Publishing post. London. £600 p.a.

Ref. B.118. British. Male. Married. Age 33. R.N. Engg. Certs., M.O.T. 2nd Class Steam Engr., A.M. Inst. Fuel. 14½ yrs. Apprentice/Chief E.R.A., R.N. Consid. exper. at auxiliary plant selection in present post including esper. Technical Sales/Devpt. Design & Project Engg. Has developed & designed wide range of boiler plant & consid. exper. oil fired & packaged boilers, oil burners & planned maintenance. Seeks **PROJECT ENGG./TECH. SALES/SERVICES ENGG. POST.** U.K. £1,600 p.a.

Ref. B.119. British. Male. Married. Age 38. C. & G. Certs. in Telephony. 2 yrs. O.N.C. course. Exper. includes 1 yr. Devpt. Laboratory Assist., quartz crystal mnfr. (radio). 1 yr. Telecomm. Mechanic, fire control computers. 2 yrs. Equipt. Engr. & 4½ yrs. D/man. Telephone exchanges & equipt. 4 mnths. D/man, power station boiler plant. 5 yrs. Senr. Design D/man, electrostatic precipitation & other gas cleaning, filters for power stations & industl. uses. At present D/man (Plant Layout & Co-ordinations Section), nuclear power stations. Seeks **D.O. OR ENGG. POST.** London. £1,100 p.a.

Ref. B.120. British. Male. Married. Age 34. O.N.C. Standard. Now taking Sales Course. 3 yrs. D/man, telecommunciations. 3 yrs. D/man, electrical furnaces. 3 yrs. Asst. Ch. D/man, light structural prefabrications. At present D/man, nuclear power stations. Seeks post as **TECHNICAL OR SALES REPRESENTATIVE,** S.E. or S.W. London or Kent. £1,250 p.a.

Ref. B.123. British. Male. Married. Age 31. B.Sc. (Horticulture). D.T.A. 5 yrs. Agronomist. 1½ yrs. Senr. Agronomist and at present on retirement leave from post as Asst. Director of Agriculture, govt. service abroad. Seeks **TECHNICAL ADMINISTRATIVE OR TECHNICAL POST** in agricultural sphere. U.K., Australia, New Zealand, Canada or U.S.A. U.K. salary £1,400 p.a.

Ref. B.124. British. Male. Married. Age 45. Nat. Cert. Mech. Engg., A.M. Inst. B.E. 4 yrs. Senr. D/man, motor components. 2 yrs, Senr. D/man gear box mnfr. 3 yrs. Senr D/man welding m/cs. 2 yrs. Senr. D/man elect. & mech. instruments. At present Senr. D/man/Designer mnfr. of mech. & electr. components. Bi-lingual English/German. Seeks post as **ASST. WORKS OR ASST. PRODUCTION MANAGER,** Slough area, West London or W. of London. £1,200 p.a.

Ref. B.125. British. Male. Married. Age 36. A.M.I.Mech.E. Grad. I. Prod. E. 5 yrs. Designer petroleum-chemical plant designers & bldrs. 2 yrs. Designer, mech. handling & coal washing plants. 2 yrs. Section Leader, petroleum chemical plant designers & builders. 3 yrs. Asst. Site Engr./Plant Layout D/man, acid, chem. & metallurgical mnfr. 2 yrs. Operating Engr., oil refinery abroad. 4 yrs. Pupil-Mech. Engr., chem. plant mnfrs. At present Designer (Chemical Plants), petroleum-chemical plant designers & bldrs. Site exper. includes survey & levelling, layout of bldgs., roads, m/cy. Consid. exper. estimation & cost control of contracts. Seeks appointment as **PROJECT OR DESIGN ENGINEER ANYWHERE** except Scotland. Salary £1,500 p.a. approx.

Ref. B.126. British. Male. Married. Age 53. 6 yrs. Bench Fitter, 6 yrs. Chargehand. 5 yrs. Works Foreman. 10 yrs. Works Manager, tube manipulation. At present Works Manager, tube manipulation (all metals). Consid. exper. tube bending m/c research & devpt., tubular fabrications, tubular chassis for motor cars, tubular equipt. for chem., aircraft, engg., automobile, refrig. & bldg. industries. Seeks post as **WORKS MANAGER,** London. £1,300 p.a.

Ref. N.129. Nigerian Male. Married. Age 29. **RESIDENT U.K.** Evening Student in General Food Technology. 9 yrs. Secretary/Accountant, printing syndicate Seeks any post in **FOOD ORGANISATION.** London. £10 15s. per week.

Ref. B.130. British. Male. Single. Age 23. Grad. I Prod.E., O.N.C. Mech. Engg. & Metallurgy endorsement in Foundry Science & Practice. H.N.C. Prod. Engg. & Metallurgy, endorsement Maths., Prod. Planning Industrial Administration & Metallurgical Analysis, Studying Inst. of Metallurgy course for L.I.M. 5 yrs. Technical Apprentice, light alloy founders & engrs. At present Works Devpt. Engr., light alloy founder & engrs. Seeks post as **ASST. RESEARCH / DEVPT. ENGR.** pref. Birmingham. £850 p.a.

Ref. A.751. British. Male. Age 45. Engg. College diploma. M.Inst. Sanitary Heating & Ventilation Engrs. 3 yrs. Student engr., office & site training, civil engrs. contr. 3 yrs. Engg. Asst., public works contractors 4 yrs, Civil engr. & Building Surveyor, private practice. 2 yrs Maintenance Engr., elec. engrs. 1 yr. Engrs. Surveyor, borough engrs. office. 2½ yrs. Consulting & Inspecting Civil Engr., air ministry. 1½ yrs. District Engr., waterways. 2 yrs. Project & Resident Engr. consulting engrs. Consid. experience of Process Plant genl. maintenance engg.. initial & planned maintenance system. Procurement of contracts for factory planning projects dealing with chemical process plant layout & genl. commercial projects. Instlln. of all types plant & m/cy for special purposes. Seeks post as **CONSULTING/CIVIL/CONSTRUCTIONAL ENGR.** London area. £2,000 p.a. min.

Ref. A.882. British. Male. Married. Age 37. Resident U.S.A.B.Sc.(Agr.). Diploma in Dairying A.M. of American Soc. of Agric.Engrs.Assoc. Inst. of British Agric. Engrs. 2 yrs. Agric. Adviser U.K. college of Agriculture. 5 yrs. Agric. Inspector, govt. agricultural dept. 1½ yrs. Livestock Inspector, Canadian Govt. 1½ yrs. Branch Manager, very large pest control & spraying company in U.S.A. Consid. exper. soil improvement, drainage, fertilisers, crops production & grading, pest control, livestock production, & grading Seeks **CHALLENGING OPPORTUNITY WITH AGRICULTURAL BUSINESS ORGANISATION.** U.K. or abroad.

Ref. B.131. British. Male. Married. Age 50. 34 yrs. Chemist, gas meter mnfrs & precision engrs Consid. exper. research & devpt. work on new materials & methods of processing, genl. control of mnfg. processes, materials & commodities (especially non-ferrous alloys, lubricants, leather & Plastics) & committee work on formulation of British Standards. Seeks **POST AS CHEMIST.** London or Home Counties pref. £1,750 p.a.

Ref. B.132. Single. Male. Age 26. Diploma of European Technical College Mech. Eng. European exper. includes 1 yr. Junr. Mech. Designer, radar. 2 yrs. Development Engr., aluminium rolling mill. U.K. exper. includes 1½ yrs. Design D/man, Radar & at present Research Engr. (Mech.), electrical mnfrs. Fluent English, Hungarian, Russian, French & German, Seeks **SUITABLE APPOINTMENT.** U.K. or abroad. £850 p.a. min.

Ref. B.134. British. Male. Married. Age 32. O.N.C. & H.N.C. (Mech.Eng) & all endorsements. G.I. Mech.E. 5 yrs. Engg. Apprenticeship. 3 yrs. Mech. Eng. D/man, marine engrs. & shipbuilders. 4 yrs. Mech. Engg. D/man, marine engrs. & boilermakers. 6 mnths. Heavy M/c Shop Inspector, marine engrs. & shipbuilders. At present Mech. Research & Devpt. Engr., boilermakers, engrs. & nuclear power station power station constructors Seeks post as **MECHANICAL ENGINEER.** U.K. or abroad.

Ref. B.137. British. Male. Married. Age 43. O.N.C. & H.N.C. Mech. Eng. & endorsements. A.M.I.Mech.E. 1 yr. M/c Shop Trainee, radio manfrs. 1 yr. Trainee, Inspection & Progress in shops, aircraft mnfrs. 3 yrs. Layout & Detail Jnr. D/man, design & mnfr. electro/mech. equipt. for TV transmission. 1 yr. Layout & detail D/man, genl. mech. & structural engg. 7 yrs. Designer D/man & Section Leader, design & prod. of mech. equipt. for research radar. At present Senr. Design Engineer on turbo-prop. aircraft engines, includ. following designs to ultimate completion in the shops & following devpt. assesment results for improved design & quality control. Seeks post as **SENIOR MECHANICAL DESIGN ENGINEER.** London area or S. England. £1,350 p.a.

Ref. B.139. British. Male. Single Age 27. 5 yrs. Apprentice & 6 yrs. Qualified (Eng) Plater. At present Eng. Plater, bridge engrs. Seeks post as **INSPECTOR/ENGR.** London. £18 per week.

Ref. B.142. British. Male. Married. Age 41. Student B.I.M. 6 yrs. Self-employed, radio, TV & elec. work. 2 yrs. Senr. Foreman, radio & TV mnfr. 2 yrs. Charge Hand, mnfr. of photographic materials. At present Superintendent (radio & TV,) mnfrs. of aircraft components, electronics, radio, TV, guided missiles & electrical components. Exper. Control of labour, line layout, methods engg., time & motion study, prod. scheduling. Seeks **MANAGEMENT POST.** London or E. England. £850 p.a. min.

Ref. B.143. Indian. Male. Single. **RESIDENT U.K.** 2½ yrs. Apprentice, airways. 10 yrs. Mechanic air lines. Exper. on DC3, DC4, Beachcraft, servicing light aircraft. Seeks post as **MECHANIC.** London or abroad.

Ref. B.144. British. Male. Married. Age 28. D.F.H. (Hons), Grad.I.E.E. 9 mnths. Student Apprentice, light engg. 2 yrs. Grad. Apprentice, heavy engg. 2 yrs. Design Engr., power system engg. 2½ yrs Mathematical Analyst & Control Engr., steam raising plant. At present Mathematical Analyst—problems associated with engg. design—nuclear engg. Author of technical articles. Seeks post as **DESIGN ENGINEER—ELEC. OR MECH.** Greater London pref. or within 100 mile radius of London. £1,495 p.a.

Ref. B.146. British. Male. Married. Age 28. O.N.C. & H.N.C., G.I. Mech. Engrs. 5 yrs. Apprenticeship & 1½ yrs. Works Engrs. D.O. At present D/man with engrs. engaged in devpt. hydraulic transmission for diesel hydraulic locomotives—electric motors, generators & drives. Seeks post as **ENGINEER.** S.E. London, Kent. £1,000 p.a.

Ref. B.147. British. Male. Married. Age 43. Higher Grade Cert. Gas Engr., M.Inst Fuel, A.M.I. Gas E. 5 yrs. Apprentice, gas co. 4 yrs. Resident Site Engr., contracting engrs. to the gas industry, 2 yrs. Chief Inspector chemical engrs. At present Senior Contracts Engineer Boiler Plant, boiler engrs. & contractors. Seeks post as **CONTRACT ENGR., FACTORY ENGR., or ENGG. REPRESENTATIVE.** North Kent pref. or Central or S. London. £1,650 p.a.

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